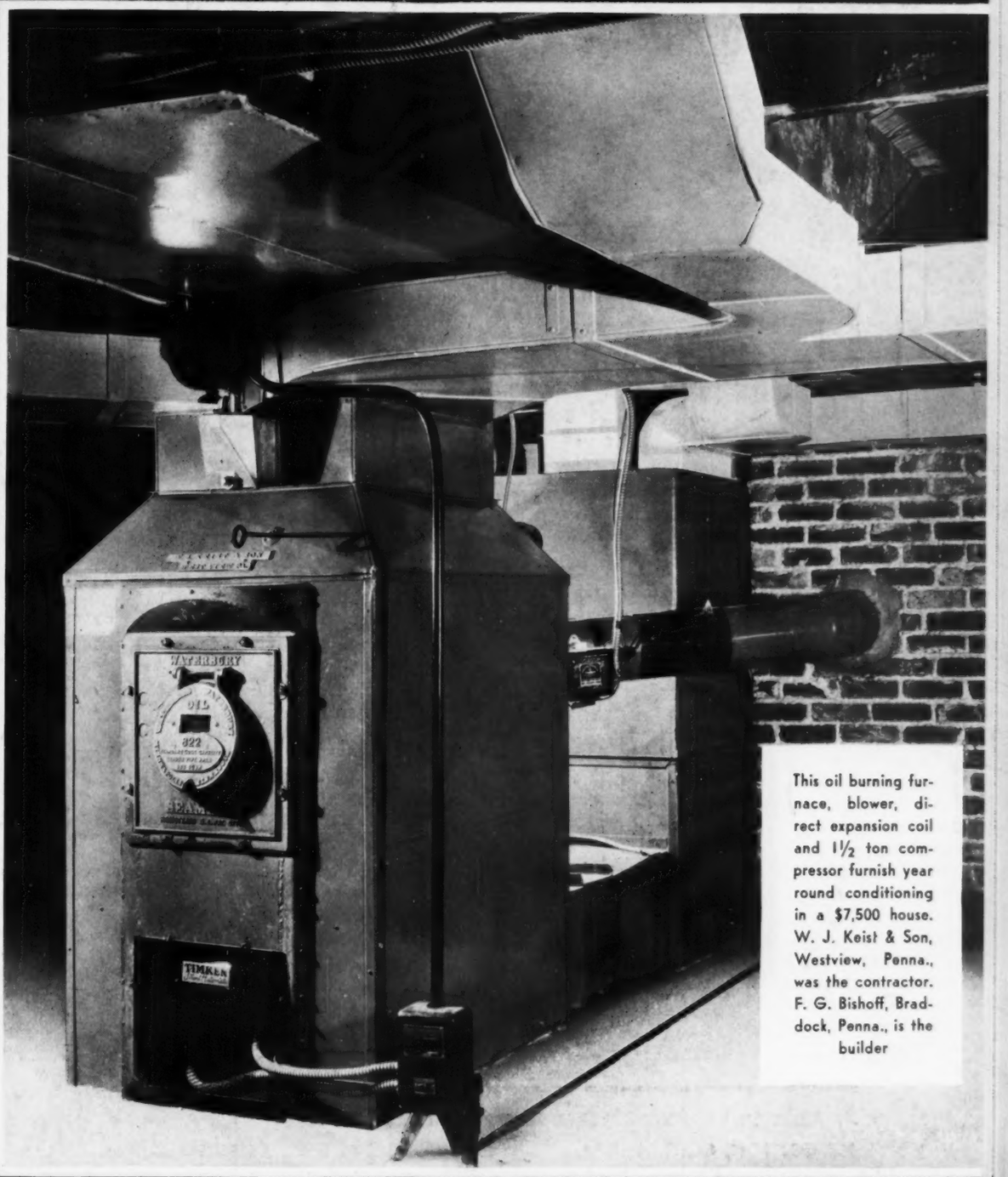
AMERICAN ARTISAN

WARM AIR HEATING • AIR CONDITIONING
SHEET METAL CONTRACTING



This oil burning furnace, blower, direct expansion coil and 1½ ton compressor furnish year round conditioning in a $7,500 house. W. J. Keist & Son, Westview, Penna., was the contractor. F. G. Bishoff, Braddock, Penna., is the builder

ABLISHED
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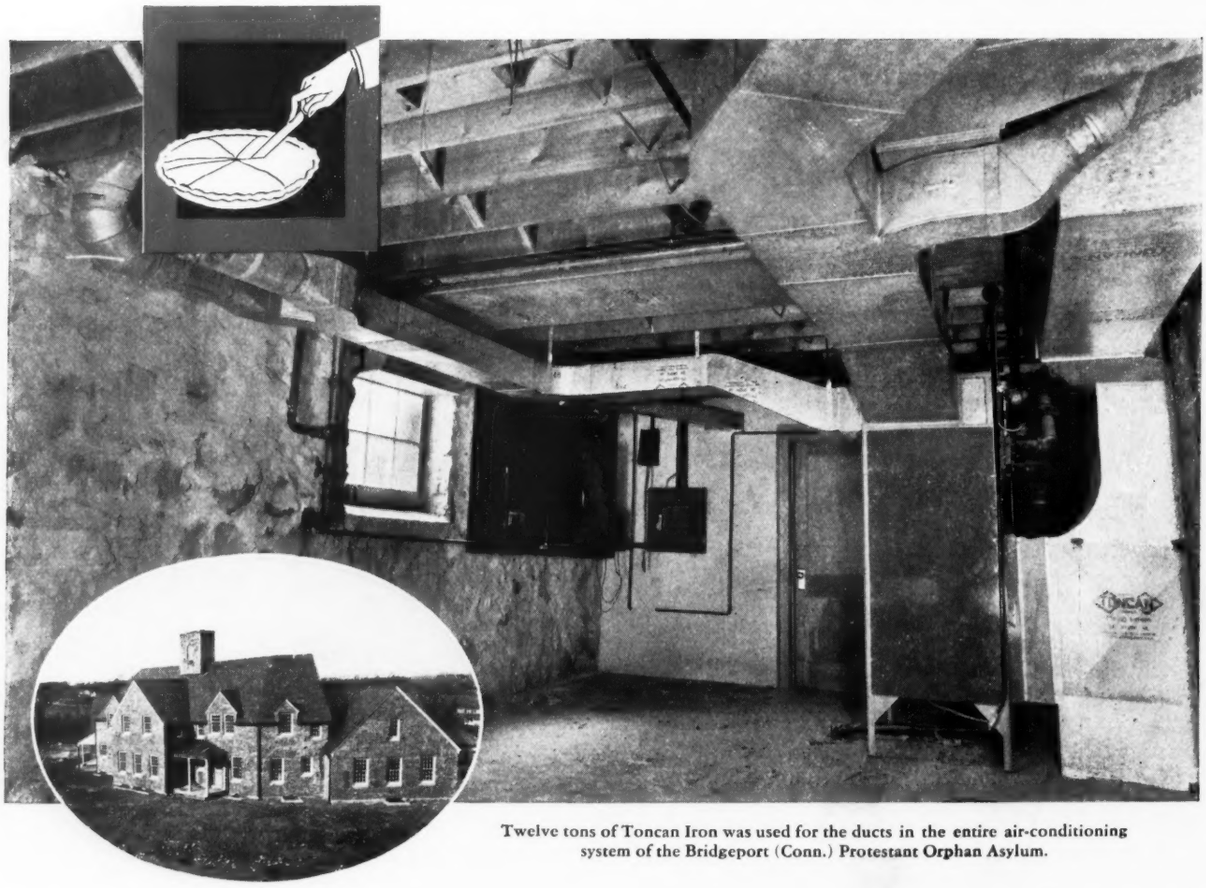
THE AIR CONDITIONING SECTION

ARE YOU GETTING YOUR SHARE . . .



Twelve tons of Toncan Iron was used for the ducts in the entire air-conditioning system of the Bridgeport (Conn.) Protestant Orphan Asylum.

OF AIR CONDITIONING BUSINESS?

—and another question: "Are you realizing a satisfactory profit on the business you are getting?"

If the answer is "No" to either or both questions, you're missing an opportunity. Hundreds of thousands of dollars are being spent in air conditioning systems, and contractors all over the country, especially those who use Toncan Iron, are making money from this type of work.

Toncan Iron—the alloy of refined open-hearth iron, copper and molybdenum—resists rust better than any other ferrous material in its price class. It lasts longer and saves money in the long run. Hence, it will aid you to make sales—to obtain a greater share of the business available.

On the other hand, Toncan Iron will help you to enjoy increased profits. It is easy to fabricate—soft and ductile—and it speeds up work in the shop and on the job.

Team up with Toncan Iron for all types of sheet metal work and you'll install better work, create good-will, build a reputation for quality work, secure more contracts and enjoy greater profits. Write for a copy of "The Path to Permanence"—it tells the full story of Toncan Iron.

REPUBLIC STEEL
REG. U.S. PAT. OFF.
TONCAN
COPPER
MO·LYB·DEN·UM
IRON

Look to Republic as a major source of supply for flat and corrugated sheets—Plain Carbon Steel, Copper-Bearing Steel, Copper-Bearing Iron, Toncan Copper Molybdenum Iron and the famous Enduro Stainless Steels. A quality of sheet for every degree of corrosion-resistance.

★ VISIT THE REPUBLIC EXHIBIT AT THE GREAT LAKES EXPOSITION, CLEVELAND, OHIO, JUNE 27—OCTOBER 4.

Republic Steel
CORPORATION
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When writing Republic Steel Corporation for further information, please address Department AA

Hold-Heet De Luxe Regulator Set

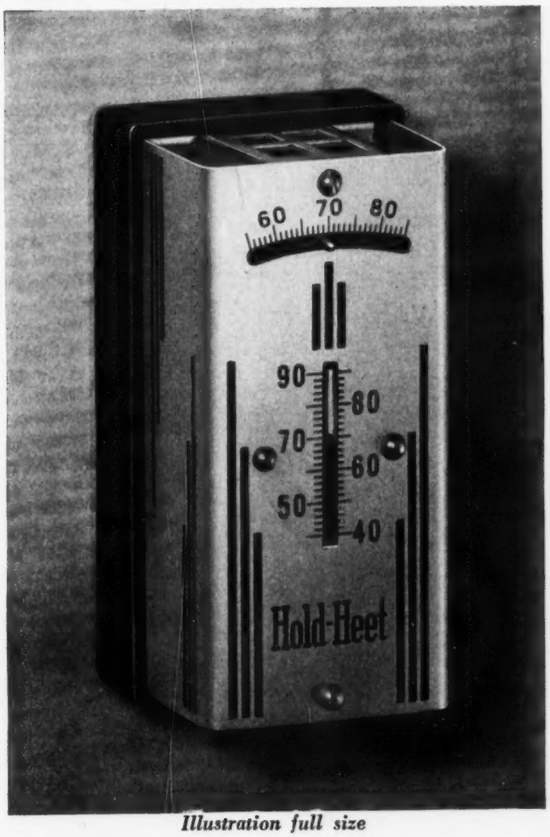

Illustration full size

- **Here is the most outstanding Quality Equipment on the Market**

COMBUSTION CONTROL is the thing. The Combustion Control in the stack is now recognized as an outstanding contribution to the control of a hand-fired heating plant. It has been adopted by 59 of the 75 furnace manufacturers.

What Is Combustion Control?

It is a dependable, time-proven, thermostatic switch that is installed in the smoke pipe close to the heating plant. It automatically causes the Damper Motor to close the "Draft" and open the "Check Draft" when the stack gets too hot. Never install a Regulator Set without a Combustion Control.

Exclusive Combustion Control Features

1. **Combustion Control Stops up-the-chimney Waste.** Excessive stack temperatures mean "coal dollars" flying up the chimney—waste of heat. By preventing this waste, the Combustion Control quickly pays for itself in fuel saving.

2. **Combustion Control Protects the Heating Plant.** Eliminates costly replacement of grates and firepots. 90% of all heating equipment burns out—it does not wear out. The exclusive Combustion Control eliminates all possibilities of this damage by preventing dangerous overheating.

3. **Combustion Control Prevents Over-runs.** When the fire is going at a tremendous rate, it does not stop just because the draft is closed. The exclusive Combustion Control always keeps the fire under control, so that it does not run wild. It is therefore quickly checked without over-runs when the Room Thermostat is satisfied and closes the draft.

This New De Luxe Thermostat

No. U3 *List* **$7.50**

Now included with the Hold-Heet De Luxe Regulator Set at no advance in Price. Here is $3.00 additional value.

Catalog No. PUI5P Hold-Heet De Luxe Regulator Set *Installed Price* $36

This complete four-piece equipment includes:

No. U3	De Luxe Thermostat ..... list	$ 7.50
No. U15	Electric Damper Motor ..... list	11.65
No. 3P	Combustion Control ..... list	7.75
No. U50	Transformer ..... list	3.10
No. K	Accessories Kit ..... list	1.90

The U3 Thermostat is only included without additional charge with the Hold-Heet De Luxe Regulator Set No. PU15P.

SELL Hold-Heet with confidence. No one has ever paid Hold-Heet one cent for repairs or service on Hold-Heet controls. If you have a Hold-Heet control that is out of order or unsatisfactory for any reason whatever and regardless of when or where it was purchased, mail it back to the factory and it will be repaired or replaced without charge.

DO NOT CONFUSE Combustion Controls with ordinary Limit Controls. The Combustion Control responds instantly to combustion temperature. There is a big lag in the response of a control in the bonnet, for the temperature of all the furnace castings must be changed before such a switch will respond. If you would hang 1,000 pounds of cast iron on the responsive tube of the Combustion Control that goes in the stack so that you had to change the temperature of all this mass before the switch would respond, you would still obtain the same results that you obtain from a warm air limit control in the bonnet.

SELF-SELLING DEMONSTRATOR PANEL For $1 additional net cost to the dealer, the De Luxe Regulator Set will be supplied completely assembled on a Demonstrating Panel all wired ready to operate. (See Illustration). A full set of accessories is included.

FREE ENVELOPE STUFFERS Every Regulator Set Package contains a coupon good for 100 free envelope stuffers. Be sure to order the stuffers and to use them.

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St. Paul, Billings

Only a Furnace System can Deliver Effective Summer Cooling at Low Cost

In This Issue

"The manufacture of tiny images on film," isn't that a good beginning for an article? A. B. Laing starts that way on page 12 and tells us just how they keep even the tiniest noise out of movie sound stages. Yet they move thousands of feet of air per minute.

*

Exhausting the air and suspended materials from a conveyor type of spray system calls for a sound knowledge of collecting. J. W. Baybutt condenses the facts in a detailed drawing and article on page 20.

*

Those who gas weld stainless steel receptacles will find some useful hints on this problem on page 79.

*

On page 29 S. Knozo continues his discussion of design procedure and furnishes some "first-time" charts for quickly correcting required cfm when there is temperature drop through the ducts. And, incidently, he corrects some mistaken ideas about the illusive "Factor 55."

*

"One place where the installer often gets into trouble is in figuring the usable area of joist spaces for return air," declares G. A. Voorhees on page 34, and goes on to give some more "first-time" tables and charts which show how erroneous it is to measure height by width and expect to get working area.

*

We've all sort of come to believe that there is a certain velocity "ceiling" beyond which we are bound to get noise. But P. H. Geiger, who has studied this problem says we are all wrong and produces the results of his tests to tell us just where and why noise occurs and how we can eliminate it. Page 36.

*

Producing a comfortable condition by drying the air was investigated in an office in Greensburg, Pa. The results and the engineering design of the system are published in detail on page 38.

*

And Eugene Farris who took the "Cost per opening" boys to task last month shows just how wrong a guess can be by taking off the material quantities pound by pound and foot by foot for his example house on page 40.

*

For those mathematical hounds who enjoy working out the underlying formulas behind our engineering we recommend the article by Professor Ebaugh on page 43. It explains how to figure the air temperature rise in cooling ducts by mathematical analysis. Incidently Professor Ebaugh charts his mathematics so that we all can use his data.

AMERICAN ARTISAN

With which is merged

FURNACES and SHEET METALS AND Warm-Air Heating

Covering All Activities in

Gravity Warm Air Heating — Forced Warm Air Heating
Sheet Metal Contracting — Ventilating
Air Conditioning

J. D. Wilder, Editor

Vol. 105, No. 8 — August, 1936 — Founded 1880

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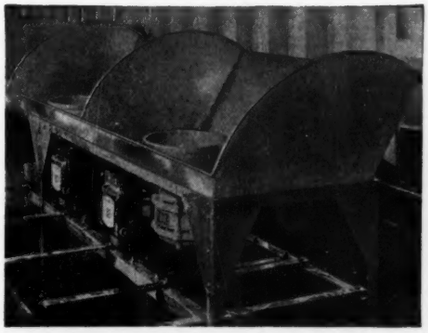
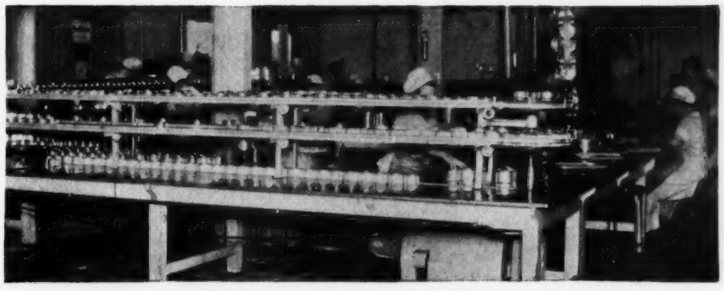
AS LONG AS PEOPLE EAT THREE TIMES A DAY...

You have a chance to sell equipment of Monel Metal to canners, preservers, and packers . . . go after their jobs!



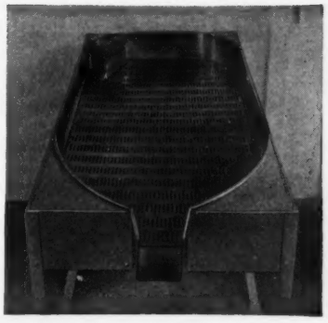
(Above) A live California contractor landed the order for these fruit juice extractor tables. He recommended Monel Metal because it resists the action of fruit acids. That's a point to remember when you talk to makers of preserves, jellies, or other foodstuffs.

(Right) An Ohio contractor got the order for this batch of scale pans. He proved that Monel Metal resists corrosion and contamination in food handling.

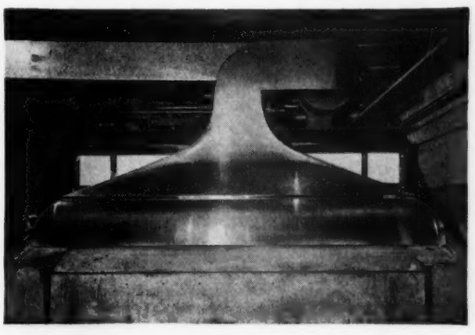


(Above) Evidence that Monel Metal withstands meat packing conditions helped a Seattle (Wash.) sheet metal shop to land this job—Monel Metal-covered tables and shelves in a chicken cannery. We supply you with printed matter you can show your prospects.

(Above) The oyster and fish packing industry offers chances to land many profitable jobs like these oyster washers. Ask for literature you can use with owners of similar plants.



(Right) A Baltimore contractor explained to an oyster packer that Monel Metal can't rust even in salt water, and so he landed an order for this oyster skimmer and pusher. A good job.



(Left) Don't forget the bakeries, cracker, cookie and candy manufacturers: they need equipment that is easy to clean, and buy a lot of Monel Metal. This oven-hood job was landed by a contractor in Schenectady, New York.

THESE photos show the kind of jobs you can get if you go after orders from food packers. First, read up a little on the kind of Monel Metal equipment they use. Then drop around at their factories and tell them that you turn out that kind of work. Do you want to land their jobs? We will send you, *free*, working instructions and detailed lists of the equipment they buy. *That* makes your part even easier. Write.

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall Street, New York, N. Y.

Monel Metal is a registered trade-mark applied to an alloy containing approximately two-thirds Nickel and one-third copper. Monel Metal is mined, smelted, refined, rolled and marketed solely by International Nickel.

Monel Metal

What do these names mean to you?

KEYSTONE COPPER STEEL
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Quality Devices
Hold-Heet
at Moderate Prices

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ANACONDA
from mine to consumer

Sheet metal men will answer this question quickly. They know each name well and have for years. Better yet, their customers know them and will approve more readily any job on which these materials are used. But, why is this true?

Advertising may make a product well-known but it cannot keep it so. Quality alone can do that. When all is said and done, that is the most any manufacturer or source of supply can offer you . . . quality materials, whenever you need them, at a fair, competitive price.

The businesses of hundreds of our customers have grown steadily for many years because they have adhered strictly to the policy of furnishing only what they knew was right. For the same reason, so has our own. If you will think of the above names and of OSBORN from your own profit angle, they can mean a lot more to you than ever before.

THE J. M. & L. A.
OSBORN Co
Manufacturers—Distributors
BUFFALO—CLEVELAND—DETROIT
Metals and Metal Products

A DEPENDABLE SOURCE OF SUPPLY FOR 78 YEARS

Unwrap Galvanized Sheets like Chocolate Bars?

Of course not—*but we wish you could.*

To judge the quality of a chocolate bar you must remove the foil wrapper no matter how attractive it may be. So it is with galvanized sheets. Galvanizing doesn't tell the whole tale. The quality of metal inside counts for as much.

You can't unwrap a galvanized sheet, but you can be just as sure of inside quality by working with Galvanized Armco Ingot Iron. These sheets are generously and uniformly zinc-coated yet beneath the bright-spangled surface is a highly refined, durable iron base—a metal that has proved its exceptional durability in more than twenty-nine years of diversified service everywhere.

Get in touch with the Armco Distributor to learn *all* the advantages of using this durable iron. He has ample stocks and is ready to serve you promptly. And be sure to ask him about the many valuable, business-creating services he offers. These include direct mail pieces, booklets, folders, blotters, work manuals, a free subscription to Ingot Iron Shop News, and many others. Contractors everywhere are cashing in on all these valuable aids.

You can, too. See an Armco Distributor salesman—or write us direct. The American Rolling Mill Company, Executive Offices, 703 Curtis Street, Middletown, Ohio. District Offices in Key Cities.

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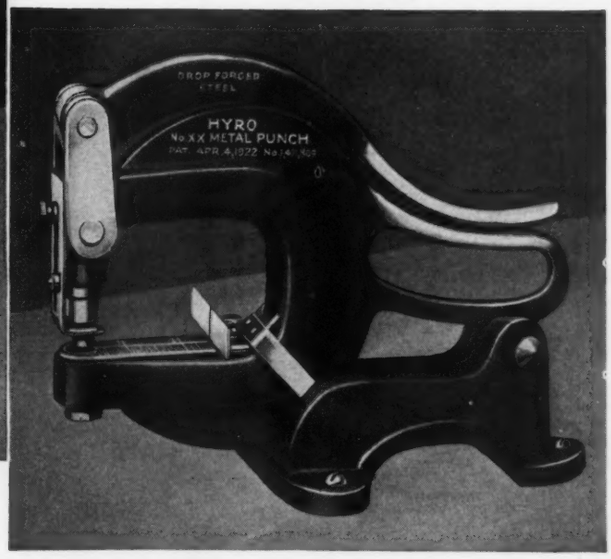
ARMCO INGOT IRON

HANDY Pipe
UP TO DATE IN 1896!
UP TO DATE IN 1936!
Handy Pipe was "the best to be had" when it was new—and it is the best to be had today—whether you are interested in standard wall-stack sections and adjustable round elbows or in the more modern type of specially designed duct-work for forced-air and air-conditioning jobs.
It costs less to buy—and less to install. Decreased labor costs mean increased profits! You can't afford to use anything else this fall.
F. MEYER & BRO. Co. Peoria, Ill.

2 PUNCHES

that will *pay their way* in any sheet metal shop



EVERY sheet metal shop has plenty of work for these two famous Metal Punches . . . work that can be done in less time, with less labor, at lower cost if these tools are on hand. And, while they cost so little to own that every shop can have both of them, these Hyro Punches have all the fine features you expect in a good punch, plus many unique superiorities of their own. Check over the brief descriptions below. Then ask your supply house, or write us, for full details.

Powerful, Convenient Hyro No. O. X. Punch Outfit

Only eight inches overall and weighing but 2⅝ lbs., this famous Metal Punch is handy, yet it has surprisingly great power. It will easily punch holes up to 17/64″ in 14 gauge metal or its equivalent. Coupled with this power are many features that provide for fast, simple operation and long life. One of the exclusive advantages is a front pointer and side gauge combination that saves center-punching. This fine Tool comes in a sturdy steel carrying case, complete with 7 punches and 7 dies. Selling for $5.90 (F.O.B. N. Y.) it represents a real tool bargain.

Hyro No. X. X. Combination Bench and Hand Punch

Here is a Tool of unusual utility. You can take it away from your bench or out on a job as a convenient hand punch. You can take it back to the shop bench . . . slip it into its specially designed stand . . . lock it tight in an instant . . . to make a sturdy bench punch. Because of this unique advantage alone, many sheet metal workers prefer the HYRO No. X. X. to any other.

But this Punch has many other superior features. It has a throat opening 3½″ deep by 2⅛″ high . . . big enough to take irregular shapes, and uses punches and dies in a range of sizes from ⅛″ to 17/32″ by 32nds. The punch and die are exposed for accurate work, and are simple to change. It works with exceptional ease and is capable of punching a ¼″ hole in 14 gauge sheets, or its equivalent. It is strongly built for long service; frame and handle are steel forgings, and all moving parts are of tool steel, heat treated. Complete it costs only $8.50 (F.O.B. N. Y.)

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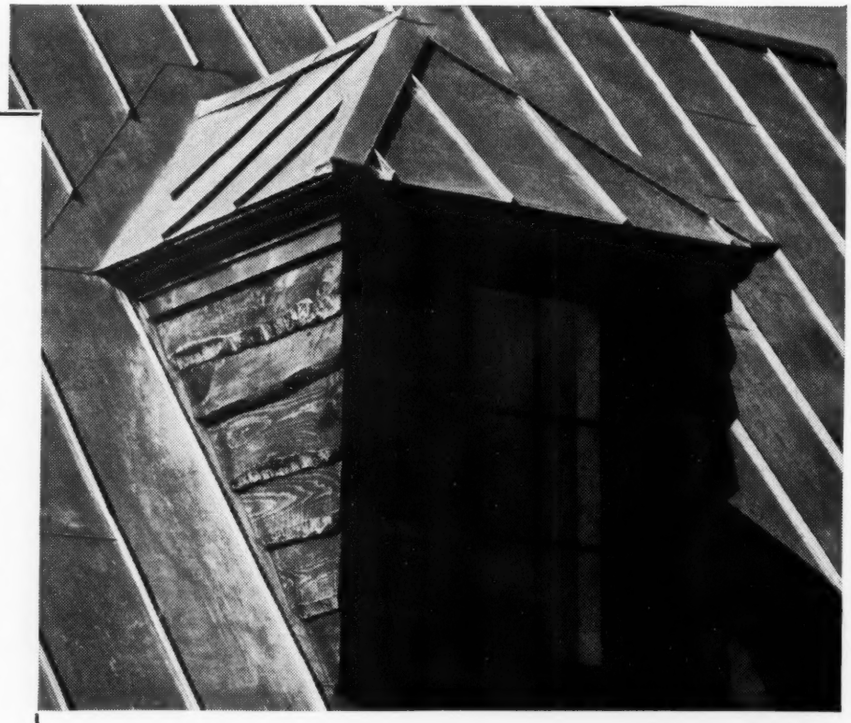

Read These Advantages of Anaconda *Economy* Copper Roofing—They are Selling Points for You

1. **APPEARANCE.** Copper increases in beauty with age and service.
2. **DURABILITY.** Permanent in spite of time and weather.
3. **FIRE-PROOF.** Copper roofs eliminate flying spark hazard . . . earn lower insurance rates.
4. **LIGHTNING-PROOF,** when properly grounded.
5. **SALES VALUE.** Copper roofing maintains value; makes houses more salable.
6. **LIGHT WEIGHT** of Economy Copper Roofing makes costly supporting structure unnecessary.
7. **PROTECTS INSULATION** of the cellular type against decreased efficiency due to moisture.

36175

YOU can close profitable sales on Anaconda *Economy* Copper Roofing. In the panel at left are listed the advantages that this sturdy, beautiful copper roofing offers your prospects. And these advantages are selling points you can use. You will find it good business to emphasize these features in talking to prospects.

Everything points to more new buildings for the next few years. Further than that, many roofs of ordinary materials long in need of repair will now either be repaired . . . or replaced. *Now* is the time to plan for *your* share of this new business. Familiarize yourself with Anaconda *Economy* Copper Roofing! For complete details, send for illustrated booklet No. C-7, mailed free on request. Your public—ever more conscious of the beauty and serviceability of copper—will listen to you.

ANACONDA
from mine to consumer

THE AMERICAN BRASS COMPANY

General Offices: Waterbury, Connecticut

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ANACONDA COPPER

AMERICAN ARTISAN

Volume 105 Number 8

Licensing Ordinances

TO protect the home owner from the unscrupulous contractor. To keep the ignoramus from installing a system which can't possibly be satisfactory. To insure installations equal to the safeguards established by the warm air heating industry. To eliminate the condemnation aroused by financially unsound, fly-by-night operators. To assure satisfactory comfort. To eliminate fire hazards.

These, in brief, are the aims of any licensing law.

Surely no legitimate, conscientious contractor has anything to fear from such a law.

Yet, licensing agreements are finding bitter opposition all over the country. Bitter opposition from those who have something to fear, and of more serious consequence bitter opposition from established contractors who claim to find in licensing laws some fancied curtailment to their operations.

We believe that these fancied objections are the result of cursory study of the advantages of licensing. The chief objection reported to us is complaint that the licensing and renewal fees are too high. "I can't afford such a fee." "Such a fee will drive small operators out of business." "Such sums are gravy for political footballing."

But is this so?

Of course a fee can be foolishly high. But the other extreme—too low a fee defeats the purpose of the law. No matter how specific a law may be no licensing law is any stronger than its enforcement. Even the Minneapolis law, detailed as it is, would be valueless without adequate and complete inspection. Only when the provisions are insisted upon and violations are corrected at the expense of the installer will a law really produce its maximum possibilities.

If all installers must and do pay the same fee, it is only logical to assume that the cost will be absorbed in the selling prices during the year. If a contractor fails to get his fee back in his selling prices he ought not be in business.

Those who might be driven from business because of the high cost of a license are exactly the ones who bring dissatisfaction upon the entire industry because they are not able to make good on their contracts and too frequently have no intention of giving a good job. Eliminating such firms from business will never harm the industry or the home owner.

Within our knowledge licensing agreements have never degenerated into political footballs for the plumbing or electrical trades and these trades have been operating under licensing laws for many years. Why, then, should a law for the furnace installer be gravy for the political bodies?

AMERICAN ARTISAN has been publicising and urging licensing laws for five years. The progress has not been startling, but has been substantial. Quite a number of codes have been placed in force. Quite a few antiquated laws have been brought up to date. Hundreds of good, sound-thinking, conscientious men all over the country have agreed that such laws are to be desired and are working to their enactment.

How soon will the industry recognize this inevitable trend?

In Memoriam

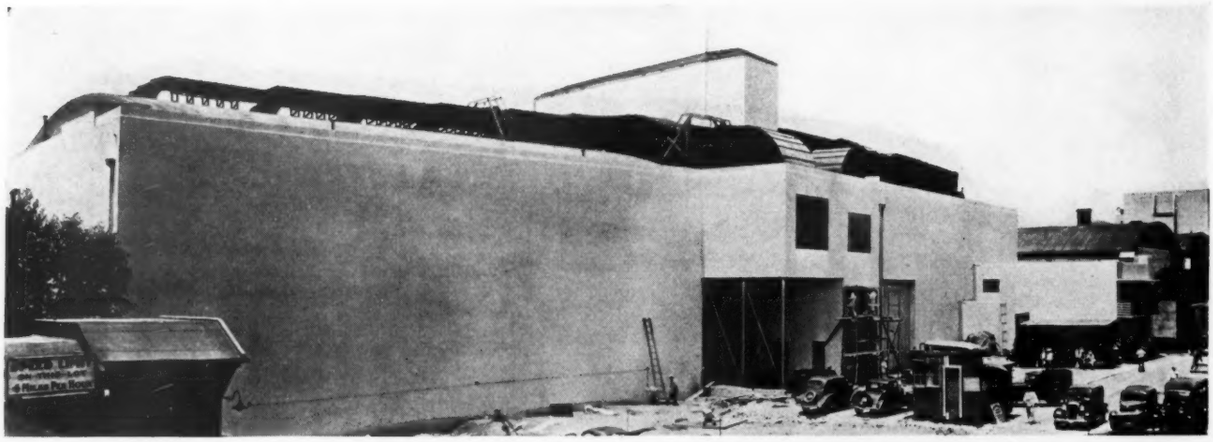
"POP" Voorhees is dead. The grand old man of Indiana; staunch supporter and well tried friend of the entire industry in the middle west collapsed suddenly August 4 and passed away the next day.

Well into his eighties, with a long and active life behind him, "Pop" seemingly came through this summer's protracted hot weather in good health, and was carrying the burdens of his business until the end.

Oscar Voorhees believed in the Golden Rule. Through good times and bad, through personal success and adversity, Mr. Voorhees steadfastly refused to admit defeat for the common good because of human failings.

No task was insurmountable. No responsibility was too costly of personal effort. Business ebb and tide; national and local experiments which drove others into a frenzy failed to shake him from his belief in the good which lies within every man.

Oscar Voorhees' business path carried him throughout the middle west. Wherever he went he left the stamp of his cheery outlook and honesty of purpose. The thousands of friends who will miss him serve as a shining reminder that honesty and forthrightness, fair dealing and a willingness to shoulder responsibility are in generous measure a reward for a work well done.



Exterior of new Columbia sound stage showing "above-roof" duct work, probably the first system of this kind built.

Noise Elimination Methods For Sound Stage Ventilating Systems

By A. B. Laing

THE manufacture of tiny images on film—America's fifth largest industry—is filled with knotty mechanical problems and headaches for ventilating engineers and sheet metal contractors.

Shot in large single-room buildings (sound stages), the air, heavily charged one moment with artificial fog for a London street scene, may have to be shifted during the next half hour to make way for the representation of the cool, clear atmospheric conditions of mountainous Tibet. Cuties emote before the cameras in wintertime, clad in the light costume of a fan dancer, while in mid-August Arctic sequences may have to be enacted with the characters encased like Eskimos, in bear or seal skins.

Under normal studio overhead ("nut") of approximately $2,500 per hour, such air changes must be made in the shortest possible time.

Mechanical noise is "out." Intakes from the street must convey not even a hum from the traffic and vibration from the huge blowers must be eliminated entirely. So sensitive is today's recording apparatus that any reverberation in the duct system would result in laughable sound distortions when the recording was subsequently transmuted into "light" and projected to the theatre screens.

An example of how an extraneous sound crept into a film and brought a laugh in the wrong place and thereby ruined a reel upon which much money had been expended, was recently heard by a preview audience. A cow mooed in a distant pasture—apparently. But the accompanying episode on the screen was located at the bottom of the sea, wherein a diver was supposed to be rattling a heavy chain as he wrapped it about a sunken sea chest. "Silence" must be enforced.

General Details

New structural work around the Hollywood lots—recently completed, newly started or planned—totals some $12,000,000. Of this sizable expansion program, a large percentage is being devoted to more scientific air conditioning, ventilating, heating and sound deadening.

Fox, Warners, RKO and Columbia, in particular, are putting in or have completed plants which embody many new developments in the fascinating realm of air handling.

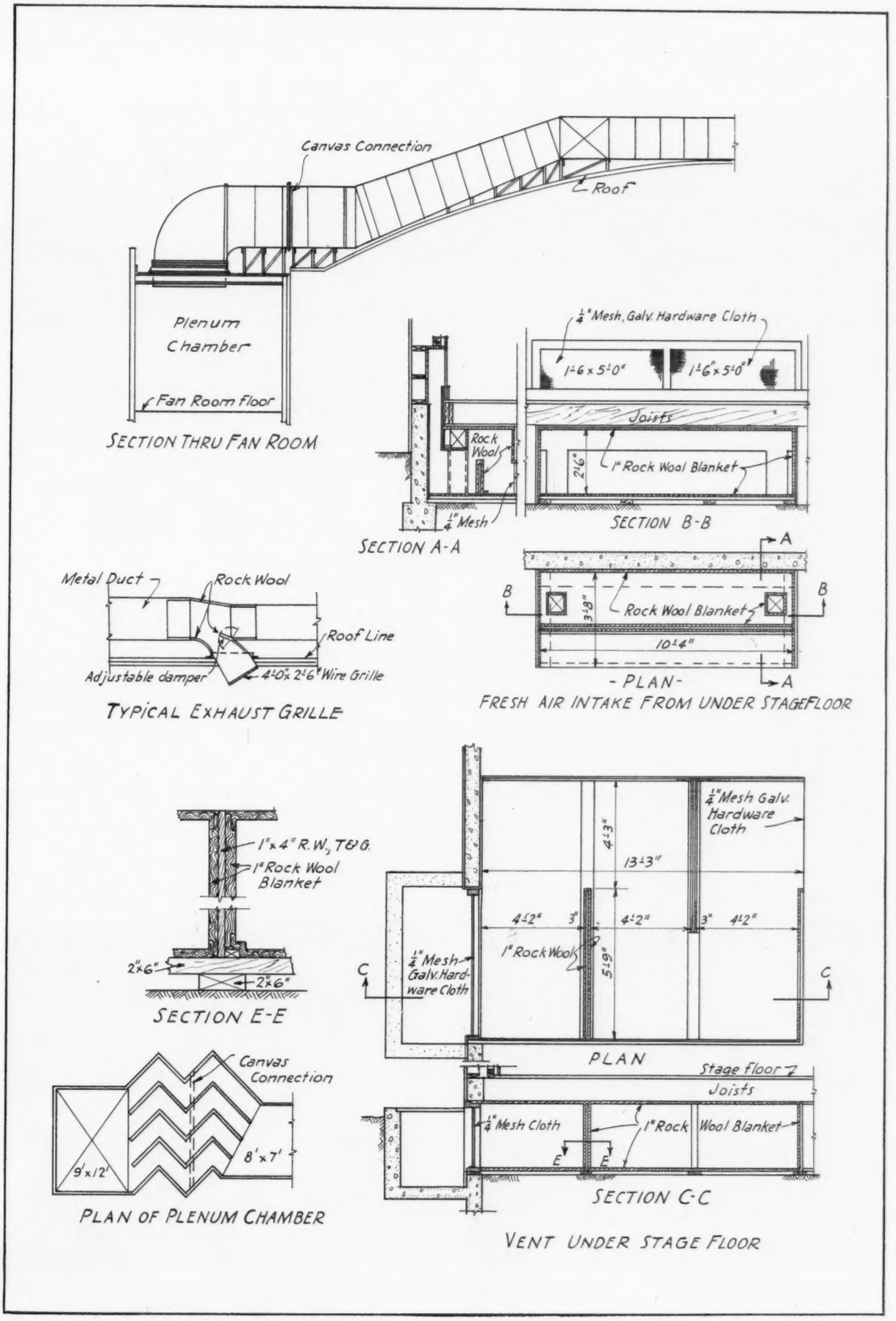
At the two last-named studios the contract was awarded McCluney Bros., 1023 Santa Fe Ave., Los Angeles, covering sheet metal, heating and ventilating. The installation at RKO was let by Mike Brady, lately appointed studio construction superintendent there, and is interesting in point of size, since the installation was made in the largest sound stage at the film capital.

The Columbia installation, embracing some $12,000 worth of duct work, is interesting, inasmuch as it included certain rather unique heating arrangements.

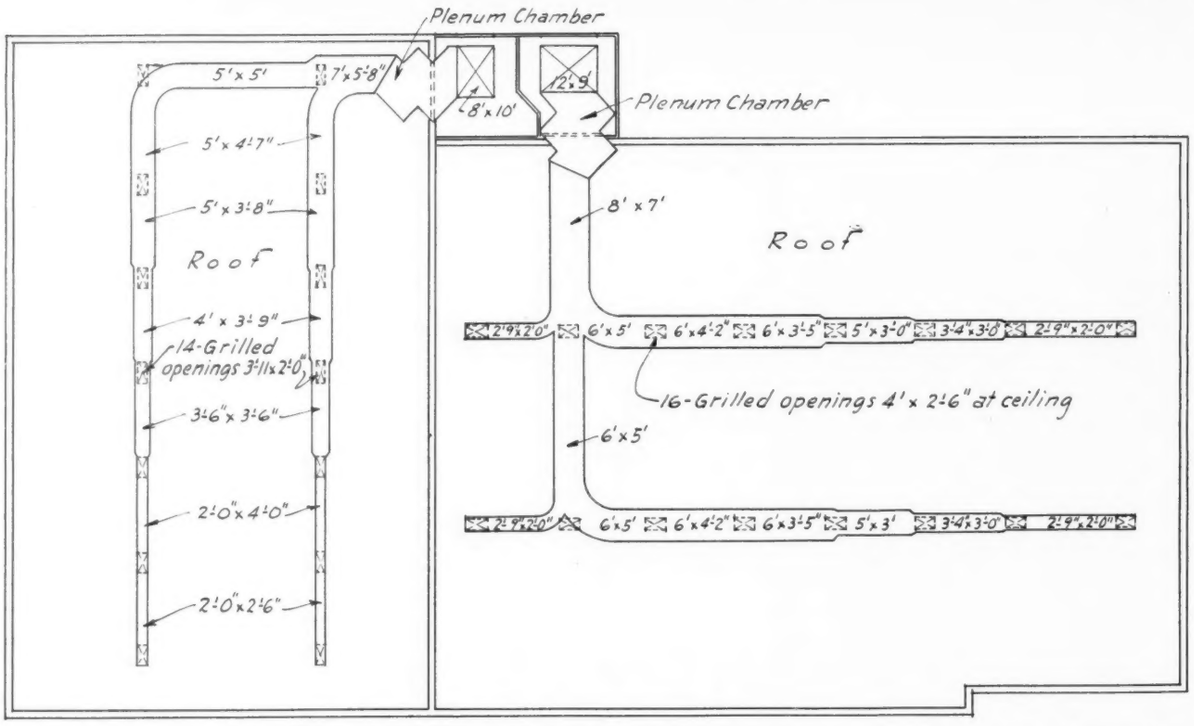
"Only two or three like it in the U. S. A., so far as we know," said the elder McCluney, head of this pioneer California firm.

The "stoves" he used for heat are of the suspended type, gas-fired unit heaters, each with a capacity of 18,000 B.t.u. to deliver 2,300 c.f.m. They are provided with ⅛ H.P., 220 V., 60-cycle, single phase motors and fans as approved by AGA. The units are vented to the roof with 5-inch 24 ga. galvanized iron pipes and are rigged with four separate safety devices, cutting out if overheating occurs or if fan stops, etc.

The entire system—heating and ventilating—was designed under the supervision of George Anderson, studio architect in charge of physical properties, and Denver



Details of intakes and vents outside the building. The baffles eliminate all outdoor noise.



General plan of Columbia's "above-roof" duct work showing plenum chamber with baffles and ducts with branches which open into the stage below.

Harmon, construction superintendent.

Ventilating system of the two stages shown are of interest on several counts. As the plans show, the buildings have been erected, Siamese-twin fashion, on separate concrete foundations, yet joined above and plastered integral.

The entire basement is plenum space. Intakes are equipped with sound traps, each thirteen feet long, which successfully prevent traffic or other noises entering the plenum. The means by which this is accomplished is plainly shown. All wall area of the trapping chambers are lined with 1 inch of rock wool. The baffles are constructed of redwood, for its rot and fire-resisting properties, also lined with 1 inch of rock wool. The panels are of 1 by 4-inch lumber, tongued and grooved and kiln dried.

Air outlets to the stage from the plenum are similarly protected, though the chambers in this case are less than half the size of the outer ones, and are fitted with but one baffle each.

The pressure fan on the roof of Stage No. 8 delivers 54,000 c.f.m. with an outlet velocity of 1,220 f.p.m. operating 258 r.p.m.—regular 10.5 H.P., $\frac{7}{8}$-inch S.P. The blower on Stage No. 9 operates at 220 r.p.m., exhausting 80,000 f.p.m.

Both are adjusted by anemometer, are double width, full housed arrangements with double inlet and top horizontal discharge. They are seated on silent floating bases. Drive is by cog belt. The connections are of the canvas bellows type. In the

(*Continued on page* 92)

A typical sound set, showing three scenes being shot with huge battery of lights and indicating need for rapid air change.

A fan room on the Paramount lot showing a typical ventilation fan assembly.

A Survey of Speculative Building In the Middle West

Speculative builders are adopting forced warm air for houses costing as little as $4,000. This survey discloses the types of systems and the apparatus

A SURVEY of the large scale construction of low to medium-priced small homes in various parts of the Middle West shows warm air heating leading the field by a wide margin.

Equally interesting is that around 90 per cent of the furnaces use coal for fuel, the use of winter air conditioning runs about 15 per cent of the cost of the structure, with indications of increased use later on as owners of the homes, financed under the Insured Mortgage System of the Federal Housing Administration, improve their financial position.

Exposed walls and roofs or construction such as brick on hollow tile have brought out some very interesting estimates as to the fuel consumption of warm air furnaces, depending upon the number of rooms and size of the homes. Until a winter season has passed, the accuracy of these promises cannot be checked, but records of people who have insulated homes attest to the savings in fuel consumption.

Winter and full air conditioned furnaces are making their appearances in the upper crust of the medium-priced homes, such as those costing $7,000 to $9,000; but circulating warm air systems because of the price of the building, are being installed in dwellings selling for about $6,000 in some cases.

$6,000 Homes

Two of the largest "small home" developments in the Middle West are located at Kingston Park and Ferguson, Missouri, both close-in suburbs of St. Louis. In both instances the homes are brick on hollow tile and of the one-floor type, although the architectural design runs to English, Dutch and Colonial.

The Kingston Park development is the work of Max Risch, Jr., the third generation of a family of builders well known in the Mound City area. The Ferguson project is handled by Harper-Koeln, Inc., a firm of builders who previously confined their activities to Pasadena Hills, where homes costing up to $30,000 were built.

Pipes and Blowers

An interesting feature of the heating installation in the homes of both developments is the pipe arrangement. Recreation rooms are popular with St. Louis people and the basement is divided into two parts, the heating plant, coal storage and laundry being arranged along one side, with the other portion clear. This necessitates full headroom and to this end the pipes are bent over the floor girder and between the joists, an arrangement which gives the basement a much more spacious appearance.

The furnaces in the Risch homes are Iasco, installed by the Stockton Supply Company of St. Louis. Approximately 15 per cent have blower attachments, but there is such an interest in blowers and heat control systems that Mr. Risch estimates that from 60 to 70 per cent of the homes will install them within the next five years, by which time he believes owners will be in shape to handle the expense without overburdening themselves.

"Our people like the winter air and temperature control systems, but after making the down payment on their homes and taking care of other expenses attending the purchase of a new home, they feel they ought to wait a while," said Mr. Risch. "They don't want to take on anything they can't pay for at this time."

The Risch homes, five and six rooms, average around $6,000. The walls are brick on hollow tile with casement windows, in fact the only wood on the outside is the doors. Hard by Jefferson Barracks and on a main highway, it is a popular district but still only nine miles from downtown St. Louis.

$3,950 Development

The Mueller Furnace Company, St. Louis office has the contract for installing the heating plants and equipment at the Harper-Koeln development where five-room houses, face brick on hollow tile, are being sold for $3,950. The great majority of the dwellings are financed under the Insured Mortgage System of the Federal Housing Administration, with payments including principal, interest, mortgage and hazard insurance and taxes, running $27.03 per month for a period of 20 years.

(*Continued on page* 82)

Skylight Construction

Presenting the procedure for designing, developing and estimating the quantities of a puttyless, double-pitched skylight.

By William Neubecker
Head Instructor,
Sheet Metal Department, New York Trade School

FIG. 6 shows a perspective view of a double pitched skylight whose construction will be of a puttyless type. Such a skylight is simple in construction, but is strong and weather tight. Its pitch should be not less than one-third and can be made in sizes up to four feet in width by any length. One-third pitch means one-third the span or an 8-inch rise to a 12-inch base thus:

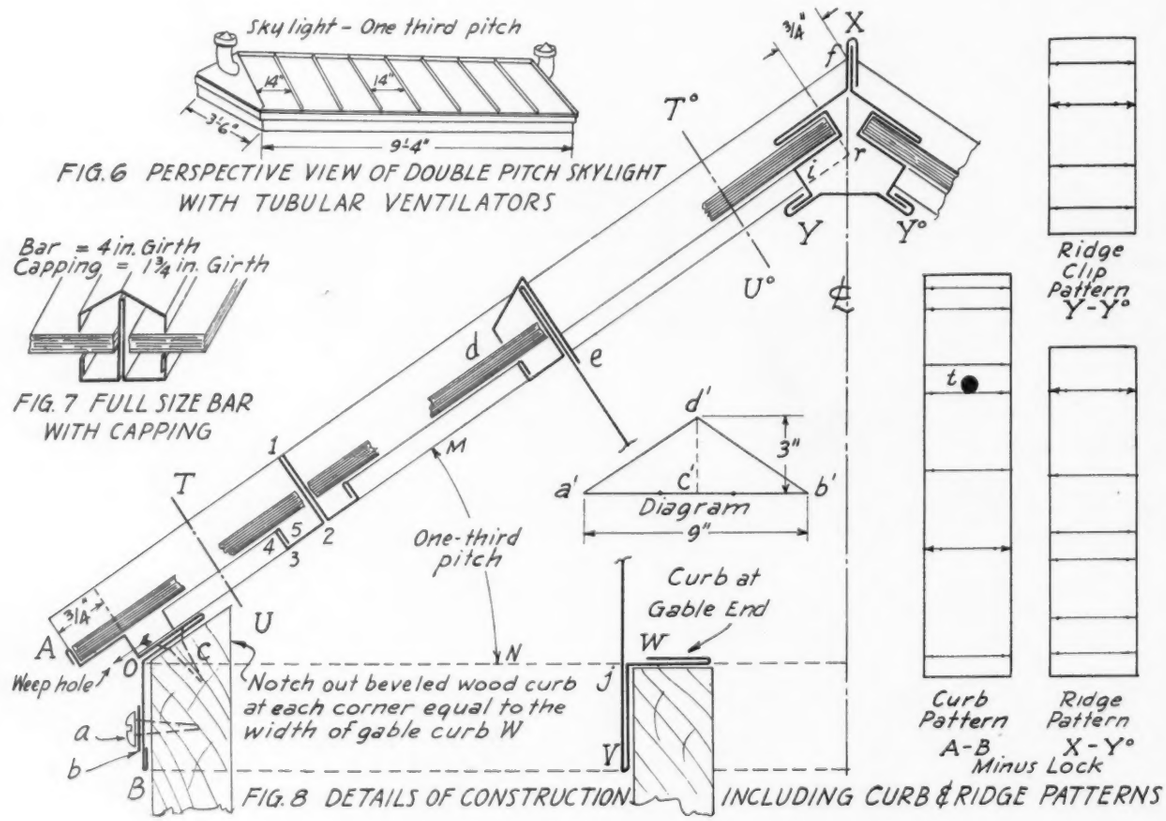
$$\frac{12 + 12}{3} = 8$$

When designing the skylight bar shown sectionally in Fig. 7, make the girth of the bar 4 inches thus obtaining 6 widths from a 24-inch sheet. The girth of the cap will require 1¾ inches.

When laying out the details for the skylight, regardless what its pitch may be, it is not necessary to lay out the full width of the gable end. Simply take any number, which when divided by three will give a whole number. Take for example the number $9 \div 3 = 3$. Then 3 inches is the altitude of a right angle triangle whose base is 4½ inches and its hypotenuse gives a pitch of one-third as shown in the diagram in Fig. 8 by a' d' b'. The pitch can also be obtained by drawing any line as a' b' in the diagram; divide this line in three parts as shown by the heavy dots and set off one of these parts on the perpendicular line c' d' erected from the center of the line a' b', resulting in the one-third pitch c' d' b'.

Assuming that a different pitch was desired, then simply divide the base line into as many parts as the *pitch number,* and erect one of these parts on the center line as just explained.

Fig. 8 also shows the constructive details and sections. A-B indicates the section at the foot of the pitched skylight; *1* to *5* the section of the common bar; *d-e* the section of the half bar at the ends; *X-Y-Y°* the



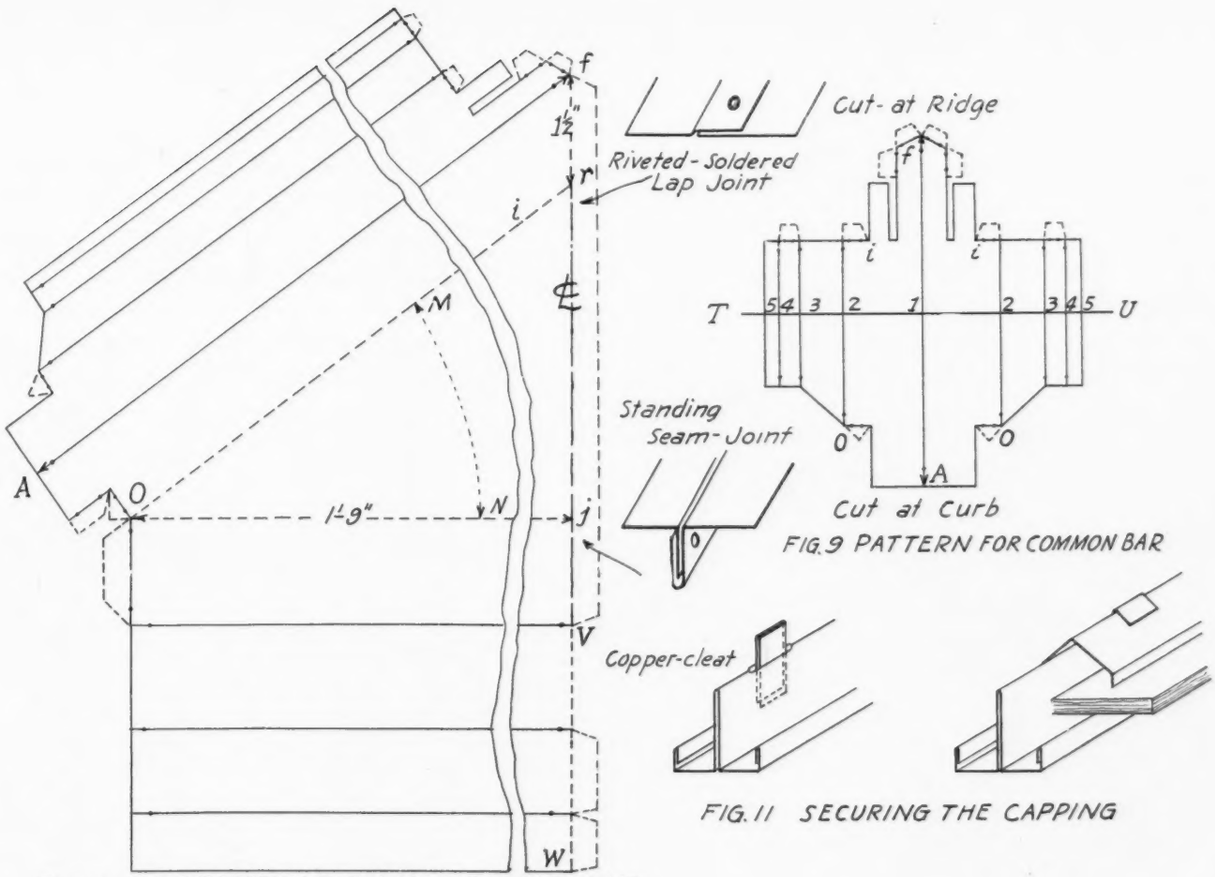


FIG. 10 HALF PATTERN FOR GABLE END WITH LAPS

FIG. 9 PATTERN FOR COMMON BAR

FIG. 11 SECURING THE CAPPING

section of the ridge bar and *V-W* the section of the curb at the foot of the gable ends. Care must be taken to draw the various sections in their proper relative positions as shown, as that is more than half the battle in designing and laying out the various types of skylights.

In designing the ridge bar, the thickness of the glass to be used must be known so that the groove at *i* will allow a snug fit. To facilitate bending the metal in the brake and assembling, the ridge bar has been made in three parts with a lock at *X* at the top, and a closed bottom, locked at *Y* and *Y°*. The half bar *d-e* is bent direct to the cheek or gable end as shown.

In the lower curb *A-B* the arrow indicates the position of the weep holes which are placed in the center of each light. There will be four patterns required for this type of skylight namely: curb, ridge bar, common bar and gable end. No miter cuts will be required on the curb or ridge, but will be necessary on the common bar and gable end.

For the pattern for the curb *A-B* at the foot of the gable, take the girth of this section and place it as shown at the right. In its proper position locate the weep hole *t* to correspond to the weep hole shown in the section *A-B*. In a similar manner as shown at the right place the girth of the ridge bar. Measuring from the arrow points these three patterns will measure 9 ft. 4 in. when set together, as indicated in Fig. 6.

Common Bar

The pattern for the common bar with its upper and lower miter cut is shown in Fig. 9 and is obtained as follows. Take the girth of the common bar in Fig. 8 from *5* to *1* and set it off on the horizontal line *T-U* in Fig. 9, and through these points draw perpendicular lines indefinitely as shown. At right angles to the pitch line in Fig. 8, draw the lines *T-U* and *T°-U°* at pleasure Now measuring from the lines T-U and *T°-U°* take the various projections to the intersecting points on the curb *A-B* and ridge bar *X-Y* and place them on similar numbered lines in Fig. 9, below and above the line *T-U*. Connect points so obtained which will give the desired pattern. In laying out the full length bar, measure from the arrow points. Allow laps as shown by dotted lines. Note that the cut *A-O* at the curb and the cut *f-i* at the ridge, are reproductions of similar letters at the curb and ridge in Fig. 8. The pattern for the gable end is now in order.

Take a reproduction of the angle *O-m-n* in Fig. 8 and place it as shown in Fig. 10 by *O-m-n*. As the width of the skylight is 3 ft. 6 in. as shown in Fig. 6, lay off one half or 1 ft. 9 in. as shown in Fig. 10 and from this point *j* erect the perpendicular *j-f* and intersect this line at *r* by the line *O-m* extended. Care must be taken that the angle *O-m-n* is accurate to one-third pitch.

Another method is to divide the width of the skylight (or 3 ft. 6 in.) by 3 and obtain 1 ft. 2 in. and make the distance *j* to *r* 14 inches and draw a line from *r* to *O*. Now take the girth of the gable end curb

(*Continued on page* 83)

Welding Procedure for the Sheet Metal Shop

By J. Carl Wilson

A series of practical articles covering accepted welding practice for light gauge sheet and light structural shapes as used in the sheet metal shop for the fabrication of metal specialties, ventilating work, or general architectural practice. This fourth article discusses types of seams and jigs used in the welding of tanks made of light gauge metal. The drawing opposite shows details.

Tanks—10 Gauge Butt Seam

IN considering design and preparation of the parent metal for welding, we should realize that there have been varied discussions on tensile strength, chemical properties, etc., but very few pertinent discussions of the welds and their design with or from the welder's viewpoint. In many cases the article and consequently the design of its welded seams are laid out in the drafting room by persons not familiar with the most readily or easily welded type of seams. We don't mean by this that draftsmen are not necessary; they are, but a very good plan is to make a rough sketch of the article, and then take a few minutes of the welder's time to discuss the best type of seam for the article. This procedure will often save many dollars in welding time.

The butt type seam which we will discuss in this article is in most cases the easiest and speediest to weld if we can use a butt strap. However, the thinness of sheet metal makes it impractical in most cases to use the butt strap, therefore, making butt type seams is one of the most difficult operations and slowest to weld.

In considering the influence of parent metal penetration and weld design on the weld properties, or in controlling the weld properties, we should recognize that a weld prepared so the maximum of penetration and reinforcement can be used will stand the most shear or strain. A design using butt welds, properly made, will generally be more ductile and result in more ductile welds, than a design using lap welds. Lap welds made in flat sheets, owing to the stiffness of the seam, will fail sooner in any fatigue test to which the whole specimen is tested. Correctly made butt welds, with good penetration, will test slightly higher in tension than lap welds, due to the fact that a lap seam has a tendency to bend when tension is applied. This does not mean the lap weld is no good; it is far superior to bolts, or rivets, and is much more quickly fabricated and makes a neater, finished product. Fig. 1 is a 10-gauge butt seam, double welded tank, and its jigs. This type of tank is not the most economical, but is sometimes desirable for its smooth and symmetrical surfaces.

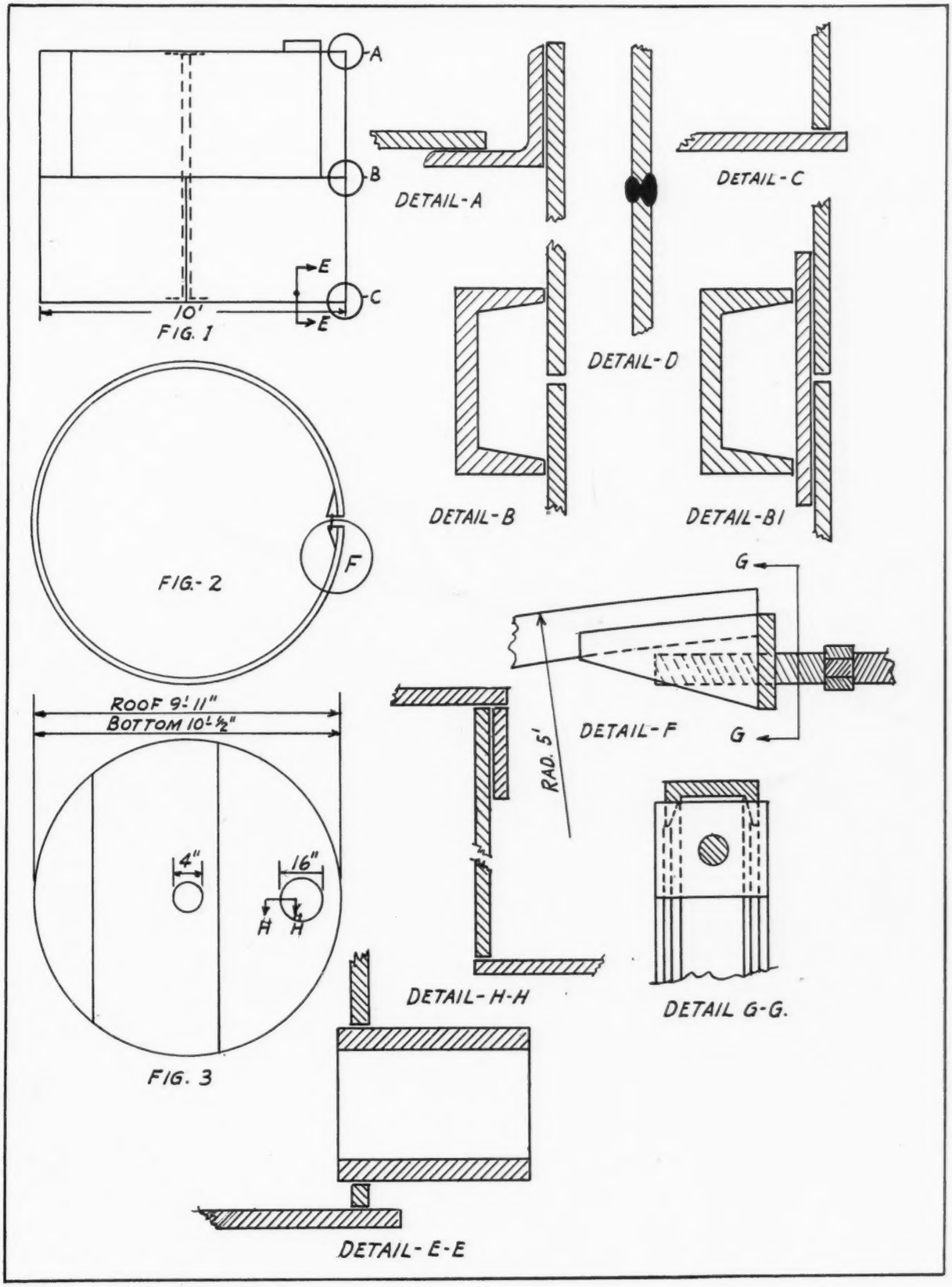
The lap type of seam is usually used when the appearance of the tank is not so essential as welding speed on lap seams is considerably faster on this type of work. If it is possible to use a butt strap under your jig as shown in Detail B-1, the butt type will be the faster seam to weld. Layout on butt type seams must be closer, as we should have 1/16-inch space between all seams. See Detail B.

Detail C shows seam welded from both sides. This is necessary only when smoothness on both sides is desired. A good welder will make this weld in one pass, and have full penetration through the sheet, but the inside will be a little rough. In Detail D the bottom is made a little larger than the tank, allowing both welds to be made without turning the tank. Bottom and roof (see Fig. 3), for this tank will take three sheets to make one tank ring, so we roll our sheets and set them on edge, and tack weld; being sure to keep our circumference in a true plane. Jigs are not necessary for welding these seams, as 10-gauge is heavy enough to weld without them, but we need jigs to hold our circumference seams in a true plane

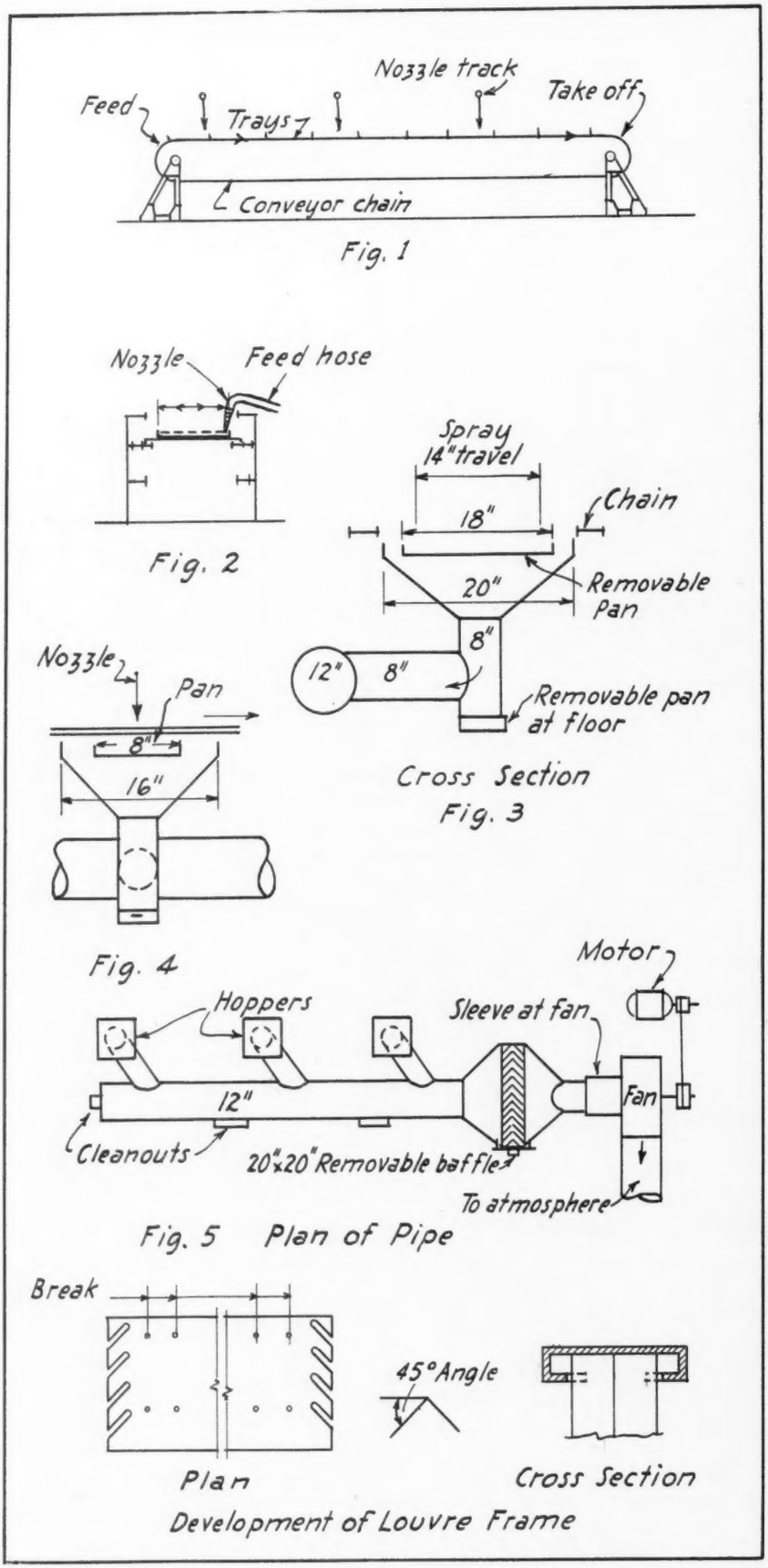
Fig. 2 shows a jig made of either 1 or 1½-inch channel iron and an inside or an outside jig. We find that the inside type has a little advantage, as it allows the fitting and tacking to be done from the outside. Construction of this jig is shown in Detail F., Section G-G. Four triangular plates are welded to the channel, and a ¼-inch plate is welded in the end. Drill and tap for right and left hand threads to fit our first ring to bottom jig. Fig. 2 shows how this helps to hold our ring round, while we tack weld the bottom.

Next, we set the second ring on and fit our jig (Detail B). To hold the 1/16-inch space, insert pieces of 1/16-inch wire at several places between the rings. Proceed in this manner till all rings are tack welded.

At this point perhaps it is well to explain tack welding. Tack welding is placing ½-inch welds every 12 to 14 inches apart, to hold the article until it is all fitted and ready to weld. Then we can turn the article so that welding can be done with the greatest speed. Detail A shows an angle iron for roof support. A good way to make this angle is to roll a piece of 2-inch or 3-inch channel iron, one-half our circumference and then cut it in the center with the acetylene cutting torch. A flat roof this size will not support itself, so we take a piece of



2-inch pipe and weld a 10-inch flange on both ends (see Fig. 1). Weld this to bottom of tank, put three guy wires to hold it in the center and our roof is ready to assemble on tank. Note 4-inch hole in center of roof. Weld to top flange of 2-inch pipe and the roof is now ready to weld solid. Detail H-H shows man hole. Turn tank on its side to weld. Use tank roller jigs shown in Article 3, Fig. 5.



Details of several possible exhaust methods suitable to common types of conveyor spray systems.

Ventilating Spray Conveyors

By J. W. Baybutt

Instructor, Rochester Athenaeum and Mechanics Institute

SOME small articles, such as buckles, etc., have the finish applied while being conveyed past a reciprocating spray nozzle as shown in sketches I and II. The pieces are placed in a slotted holder which is carried on a chain conveyor. Under full operating conditions the motion of the spray nozzle can be synchronized to meet the position of the slots but often there are empty spaces with the result that the spray material is discharged into the air unless certain precautions are taken.

In the case of manual spray painting some states demand good ventilation with this equipment and proper exhausting of the fumes is required.

A typical exhaust system for this type of work is shown in Figs. III, IV and V. The upper removable pan catches the spray when no buckles are at the right point and as these pans are easily removed they can be cleaned by immersion in suitable solvent.

The air flow on the edge of the pan is maintained at 400 F.P.M. velocity through the slot opening. Some states accept 200 F.P.M. at spray hood entrance, but in this case the 400 F.P.M. velocity is more desirable.

The removable baffle assembly is a worthwhile adjunct to the system as a tremendous amount of solid matter is intercepted by this device. The writer has seen many of these baffles completely plugged with materials such as paint. An extra unit of this type is desirable so that one can be cleaned while the other is in service. On some jobs one 8 hour trick operation plugs a unit up solid.

On the basis of 400 F.P.M. through the slot opening about 550 C.F.M. will be handled at each hopper or 1650 C.F.M. for 3 units shown in Fig. V. Using the pipe sizes shown the resistance would probably run around ¾" S.P. depending of course on the length of pipe run and condition of the eliminator assembly. A No. 30 S.P. M.E. fan running at about 1200 R.P.M. with ½ H.P. motor would easily satisfy the requirements.

Social Security—

A Summary of Unemployment Compensation

By Joseph G. Dingle
C. P. A., Ottawa, Ill.

IN the ten titles of the Federal Social Security Act, Title III should be carefully studied by every employer and every employee. Of all the publicity given the Social Security Act, no one section has been more universally misunderstood than that pertaining to Unemployment Compensation. A great many employees think that they are to be guaranteed compensation while unemployed and by the Federal Government. As a matter of fact, the Federal Act does not provide one cent of benefit for any unemployed time. The name of the title is sufficient proof of this statement: GRANTS TO STATES FOR UNEMPLOYMENT COMPENSATION ADMINISTRATION. The opening sentence of section 301 reads in part as follows:

"For the purpose of assisting the States in the *administration* of their unemployment compensation laws . . ."

One is quite likely to overlook that word "administration" and see only the desired words, "unemployment compensation.'' The Federal Social Security Board, in commenting on this phase of the Act, in its "Summary of the Social Security Act relating to Unemployment Compensation," states as follows:

"A major purpose of the Social Security Act is to encourage the States to enact unemployment compensation laws by equalizing the competitive costs in different States so far as employer contributions paid into state unemployment funds. Since the Federal tax will apply in all states, regardless of whether the state has enacted an unemployment compensation law, every state will wish to enact the necessary legislation to take advantage of this allowable credit . . ."

Let's take a look at the pertinent sections of the law pertaining to this Unemployment Compensation Administration. Section 901 is the basis for the pay roll tax. It is quoted in full below:

"Sec. 901. On and after January 1, 1936, every employer (as defined in section 907) shall pay for each calendar year an excise tax, with respect to having individuals in his employ, equal to the following percentages of the total wages (as defined in section 907) payable by him (regardless of the time of payment) with respect to employment (as defined in section 907) during such calendar year:

(1) With respect to employment during the calendar year 1936 the rate shall be 1 per centum;

(2) With respect to employment during the calendar year 1937 the rate shall be 2 per centum;

(3) With respect to employment after December 31, 1937, the rate shall be 3 per centum."

The language used in this section needs explanation. The term "every employer" is defined in section 907 (a) as follows:

"(a) The term 'employer' does not include any person unless on each of some twenty days during the taxable year, each day being in a different calendar week, the total number of individuals who were in his employ for some portion of the day (whether or not at the same moment of time) was eight or more."

Thus it appears that "every employer" does not mean every employer, nor does it mean "every employer of eight or more." An employer might employ 10,000 men daily for 33 weeks, then reduce his force to 7 men for the other 19 weeks, and still not be an employer, as defined in the Act.

Mr. J. D. Wilder,
Editor, American Artisan.
Dear Mr. Wilder:

I have just had the opportunity to read the interesting article which appeared in the June issue of the AMERICAN ARTISAN by Mr. Joseph G. Dingle entitled "Social Security—A Summary of its Immediate Requirements." I take the liberty of submitting some comments.

In the first paragraph the statement is made that the Act is, "unusual because the Federal Government tells the several States that they must pass certain laws." There is nothing in the Act requiring States to pass certain laws.

The article goes on to say the Social Security Act, "tells the several states that they . . . must levy certain minimum taxes." The Act carries no such requirement.

The further statement is made in the article that "after the taxes have been collected they must be sent to Washington where the money may be safely kept; and after proper approval by the Federal Security Board, it may be sent back to the States to be disbursed." The reference is perhaps to the taxes levied by those states enacting Unemployment Compensation laws, and as to these taxes the procedure is as follows:

The Act requires of those States which request approval by the Board of their Unemployment Compensation laws, that the taxes said States collect for this purpose shall be paid "to the Secretary of the Treasury to the credit of the Unemployment Trust Fund"; the Secretary being required to maintain a separate book account for each state agency.

The Act goes on to authorize and direct the Secretary of the Treasury "to pay out of the Fund to any State agency such amount as it may duly requisition," providing it does not overdraw the amount to its credit, and that it uses the withdrawals solely in the payment of unemployment compensation. The transaction is between the states and the Secretary of the Treasury. The Act carries no provision giving the Social Security Board the right to approve or disapprove these "requisitions" by the State agencies.

Sincerely yours,
Robert Huse,
Associate Director
In Charge, Business Information Service

Section 907 (c) defines "employment" as follows:

"(c) The term 'employment' means any service, of whatever nature, performed within the United States by an employee for his employer, except—

(1) Agricultural labor;

(2) Domestic Service in a private home;

(3) Service performed as an officer or member of the crew of a vessel on the navigable waters of the United States;

(4) Service performed by an individual in the employ of his son, daughter, or spouse, and service performed by a child under the age of twenty-one in the employ of his father or mother;

(5) Service performed in the employ of the United States Government or of an instrumentality of the United States;

(6) Service performed in the employ of a State, a political subdivision thereof, or an instrumentality of one or more States or political subdivisions;

(7) Service performed in the employ of a corporation, community chest, fund, or foundation, organized and operated exclusively for religious, charitable, scientific, literary, or educational purposes, or for the prevention of cruelty to children or animals, no part of the net earnings of which inures to the benefit of any private shareholder or individual."

Thus, as in Title II, all employees are not in the "covered class." For the purpose of Title IX, Unemployment Compensation does not cover the many fields of employment mentioned under Title II, and adds a new exclusion—service performed by an individual in the employ of his son, daughter, or spouse, and service performed by a child under the age of twenty-one in the employ of his father or mother.

State Laws

Next to be considered is what State laws shall contain. Section 303 is here quoted:

"Sec. 303. (a) The Board shall make no certification for payment to any State unless it finds that the law of such State, approved by the Board under Title IX, includes provisions for—

(1) Such methods of administration (other than those relating to selection, tenure of office, and compensation of personnel) as are found by the Board to be reasonably calculated to insure full payment of unemployment compensation when due; and

(2) Payment of unemployment compensation solely through public employment offices in the State or such other agencies as the Board may approve; and

(3) Opportunity for a fair hearing before an impartial tribunal, for all individuals whose claims for unemployment compensation are denied; and

(4) The payment of all money received in the Unemployment fund of such State, immediately upon such receipt, to the Secretary of the Treasury to the credit of the Unemployment Trust Fund established by section 904; and

(5) Expenditure of all money requisitioned by the State agency from the Unemployment Trust Fund, in the payment of unemployment compensation, exclusive of expenses of administration; and

(6) The making of such reports, in such form and containing such information, as the Board may from time to time require, and compliance with such provisions as the Board may from time to time find necessary to assure the correctness and verification of such reports; and

(7) Making available upon request to any agency of the United States charged with the administration of public works or assistance through public employment, the name, address, ordinary occupation and employment status of each recipient of unemployment compensation, and a statement of such recipient's rights to further compensation under such law.

Payment Refusal

"(b) Wherever the Board, after reasonable notice and opportunity for hearing to the State agency charged with the administration of the State law, finds that in the administration of the law there is—

(1) A denial, in a substantial number of cases, of unemployment compensation to individuals entitled thereto under such law; or

(2) a failure to comply substantially with any provisions specified in subsection (a);

the board shall notify such State agency that further payments will not be made to the State until the Board is satisfied that there is no longer any such denial or failure to comply. Until it is so satisfied it shall make no further certification to the Secretary of the Treasury with respect to such State."

The above would seem to indicate that a State law must be satisfactory to the Federal Social Security Board or the board "shall make no certification for payment." It is being argued that the board wants to control the administration of the State law, the method and manner of payment by the State of its own funds to its own unemployed; and (4) above is of such unusual interest that it is here quoted again:

"Sec. 303 (a) (4) The payment of all money received in the unemployment fund of such State, immediately upon such receipt, to the Secretary of the Treasury to the credit of the Unemployment Trust Fund established by section 904;"

Transfer of Funds

Thus the State must, immediately upon receipt, send its tax money to the Secretary of the Treasury of the United States. Having sent the State funds to Washington, the money may not be returned to the State unless and until the Federal Social Security Board approves such act. What State Constitution permits its officers to deliver State funds, levied for a specific purpose, to a Federal officer, even to the Secretary of the Treasury?

Now let's see just what a State may put in its own Unemployment Compensation Law and obtain the required approval of the Federal Social Security Board. Section 903 (a) enumerates these requirements and is here quoted:

"Sec. 903. (a) The Social Security Board shall approve any state law submitted to it, within thirty days of such submission, which it finds provides that—

(1) All compensation is to be paid through public employment offices in the State or such other

(*Continued on page 87*)

AIR CONDITIONING SECTION

CAN complete air conditioning be "sold" to the buyer of a house costing less than $8,000 is frequently asked as speculative building again becomes active. Undoubtedly complete air conditioning can be sold, but what kind of air conditioning and what percentage of total cost is of more importance. See page 32.

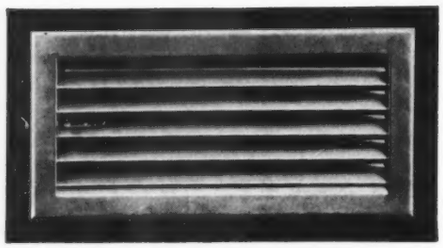
- - - G. A. Voorhees continues his series on remodeling and discusses the troublesome subject of areas of return air runs. Some heretofore unpublished charts and tables are presented.

- - - Last month Eugene Farris declared that "price per opening" was an invitation to the receiver. He backs up his declaration this month by showing a typical material quantity takeoff to show how many chances there are that a "guess" is no better than no guess at all.

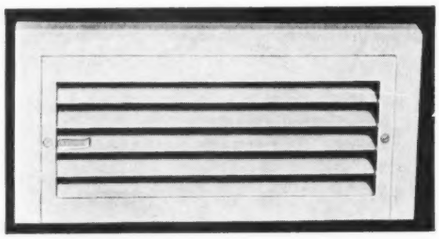
- - - We begin in this issue the first of two important articles on origination of air noise and how to overcome it.

WATERLOO

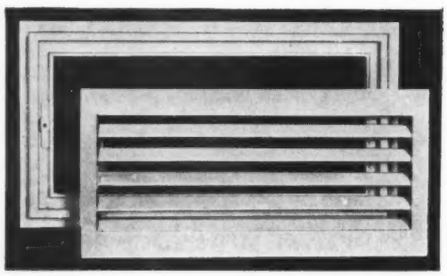
Air Conditioning REGISTERS



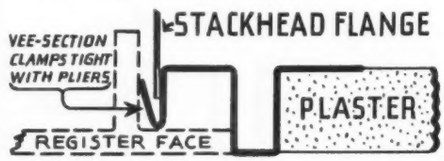
FH-100—Adjustable one-piece Venetian Type Register for walls.



FHD-204—Two-piece Venetian type adjustable register for baseboards.



FH-102—Venetian Type adjustable register for walls, with Vee-U plaster frame.



The Waterloo Vee-U Frame assures positive, tight connection with stack-head.

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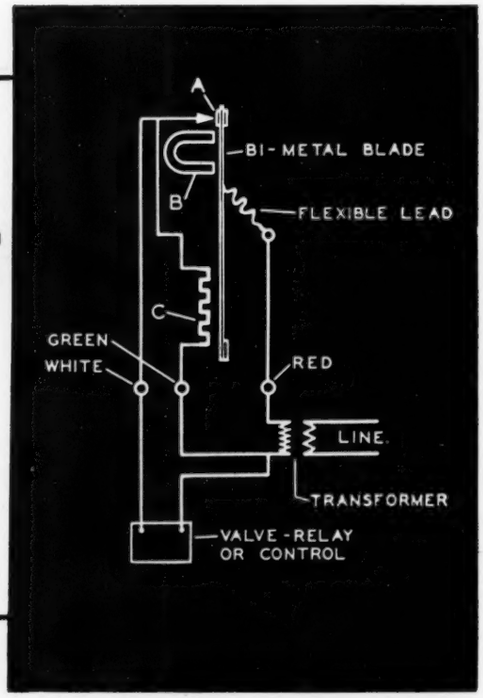
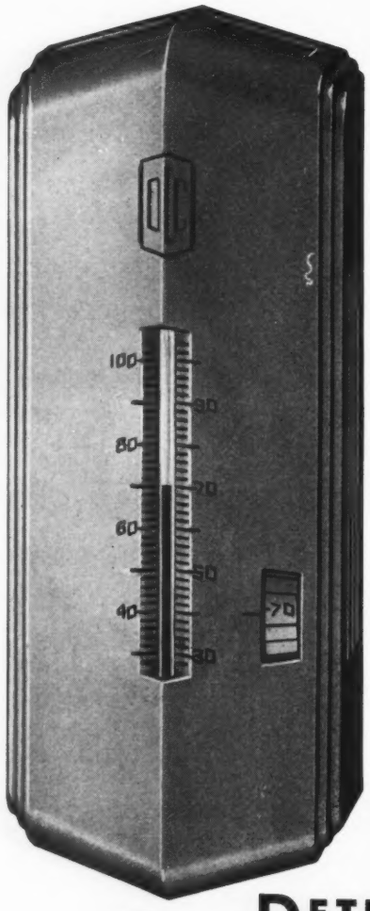
COMPENSATION ENTIRELY INDEPENDENT of electrical load on thermostat



Circuit of the Two-Eleven Compensated Thermostat showing Heater Element connected in PARALLEL with main circuit—an Exclusive feature.



● The small heater element in the "Genuine Detroit" Compensated Two-Eleven is operated in parallel with the main circuit through the Thermostat. Consequently fluctuations in electrical load can have no effect on the action of the pre-heater—nor on its accurate control of differential. This is an important factor in attaining straight line temperature control and an exclusive feature of the Two-Eleven.

Also, because the heater element is readily adjustable, the Two-Eleven can be used for any load without changes or replacement of any element. This means that you stock only one type for all 20-25 volt circuits.

Adjustment of the small heater element is easily made to satisfy any local requirements—type of exposure, kind of construction or type of heating plant. Radical changes in temperature have no effect on its accurate straight line temperature control.

The Two-Eleven is a masterpiece of engineering design beautifully finished to harmonize with artistic interiors. It is supplied with or without heat compensation—both types in all models for heating, cooling, night and day, summer and winter and three wire.

Write for Bulletin 86.

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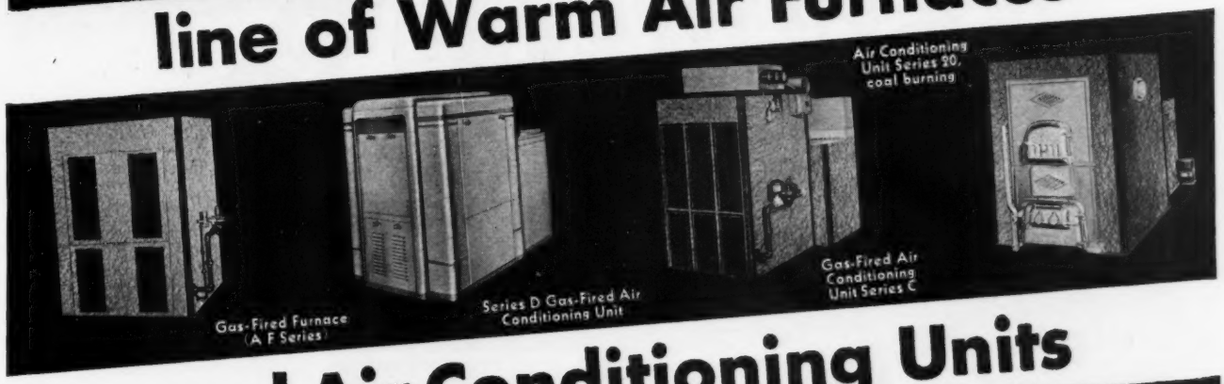
SUNBEAM offers the most complete line of Warm Air Furnaces and Air Conditioning Units


Gas-Fired Furnace (A F Series)
Series D Gas-Fired Air Conditioning Unit
Gas-Fired Air Conditioning Unit Series C
Air Conditioning Unit Series 20, coal burning

Oil-Fired Air Conditioning Unit (100, 200, 400 Series)
Air Conditioning Unit 720-R-10 complete with oil burner
Air Conditioning Unit 720 R-9 needs no basement
Air Conditioning Unit Series 80 for coal or oil

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Forced Air Heating Facts From the Research Residence

By S. Konzo
Special Research Associate
Engineering Experiment Station
University of Illinois

Design of Forced-Air Heating Systems (Part 3)

Introduction

IN the previous article it was shown that the register air temperatures in any forced-air heating plant are not uniform in value and that such non-uniformity may lead to difficulties. If, for example, the assumed temperature for the air leaving the supply registers is 135 deg. F. and the actual value is 115 deg. F., due to the heat loss in the duct leading to the register, the actual air volume required at the register face will be 35 per cent greater than that calculated by assuming a 135 deg. register air temperature. A large adjustment in the dampering of this system will be necessary, which may require increased fan speeds with a resultant increase in power costs, air noise and drafts.

The values for heat loss from ducts cannot be readily calculated on account of the numerous factors which affect that heat loss. It is suggested therefore, that for ordinary design purposes some "average" value of the temperature loss per foot of ducts should be used. The results in the Research Residence indicate that for an initial temperature of 135 deg. F. in a duct whose length is approximately 30 feet, the temperature drop per foot of duct is of the order of 0.4 to 0.6 deg. F. A value of 0.5 deg. per foot of duct is recommended for ordinary practical design.

Object

A. It is the purpose of this article to present the relationship between the air volume required at the supply register and the heat loss from the room. In order to facilitate the calculations, the equation has been simplified to its simplest form and the values have been presented both in tabular form and in the form of a curve.

B. A suggested form sheet to be used in making calculations of the air volume requirements is also presented.

C. The method of calculating air densities is indicated, and a simplified chart is presented which enables one to select the value of the density when the temperature and barometric pressure are known.

D. The use and the limitation of the factor "55" is also discussed.

A. Relationship of C. F. M. to Heat Loss

In order to maintain a room or structure at a given room temperature when the outdoor air temperature is less than that indoors, it will be necessary to supply enough heat to that room to exactly offset the heat loss from the room. In the case of a forced-air heating system this may be expressed in the following manner:

(Heat supplied to room in form of warm air) = (Heat loss from room) (1)

in which the "heat loss from the room" can be calculated in terms of B.t.u. per hour for a given condition.

The "heat supplied to the room in the form of warm air" represents the heat given up by the warm air, which enters the room at the temperature ($t_{reg.}$) and leaves the room at the temperature (t_{return}). Therefore, the first term of equation (1) may be expressed as:

(Heat supplied to room in form of warm air) = (Weight of air in lb. per hr.) $\times$ (0.24) $\times$ $t_{reg.} - t_{return}$) (2)

in which the constant 0.24 represents the number of B.t.u. required to raise one lb. of air 1 deg. F.

Equation (2) may also be written in the form shown in equation (3):

(Heat supplied to room in form of warm air) (B.t.u. per hr.) = (Air volume in c.f.m.) $\times$ 60 $\times$ $\text{Density}_{reg.}$ $\times$ 0.24 $\times$ ($t_{reg.} - t_{return}$) (3)

Equations (2) and (3) may be writen in abbreviated form, as shown in equations (4) and (5) respectively:

$$H = (\text{lb. per hr.}) \times 0.24 \times (t_{reg.} - t_{return}) \quad (4)$$

$$H = (\text{c.f.m.} \times 60) \times 0.24 \times \text{Density} \times (t_{reg.} - t_{return}) \quad (5)$$

It may be noted from equation (5) that a relationship exists between the heat loss from the room and the air volume delivery at the registers. Furthermore, in order to determine the air volume delivery for any given case, it is necessary to assign some numerical values to the density, and the temperatures of the air at the supply register and the return grille. By transposing the terms in equation (5) the equation may be reduced to its simplest form:

$$\text{C.f.m.} = \frac{\text{Heat loss from room, H}}{60 \times 0.24 \times \text{Density} \times (t_{reg.} - t_{return})}, \quad (6)$$

or C.f.m. = H $\times$ Factor (7)

For the convenience of designers of forced-air heating installations, the curve shown in Fig. 1 and the values listed in Table 1 have been prepared. They

show the value of the factor to be used for various values of the register air temperature.

Example 1. Given a room having a heat loss of 10,000 B.t.u. per hour.

Assumed register air temperature = 110 deg. F.

To find the c.f.m. required at the supply register.

From Fig. 1 and Table 1 it may be noted that the factor corresponding to 110 deg. F. is equal to 0.022. The air volume required is, therefore,

$$0.022 \times 10{,}000 = 220 \text{ c.f.m.}$$

TABLE 1

(Value of Factor to be used in the equation: C.f.m. = H × Factor)

(Based on a return air temperature of 65 deg. F. and barometric pressure of 29.92 in. of Hg.)

Register Air Temperature	Value of Factor
90	0.0384
100	0.0279
110	0.0221
120	0.0184
130	0.0159
140	0.0140
150	0.0125
160	0.0114
170	0.0105
180	0.0097
190	0.0091
200	0.0085

Example 2. For the same room having a heat loss of 10,000 B.t.u. per hour, what value of c.f.m. is required at the register for a register air temperature of 140 deg. F.?

C.f.m. = 0.014 × 10,000 = 140 c.f.m.

B. Form Sheet for Calculating Air Volumes

The design procedure which is commonly used assumes a single value for the temperatures of the register air at all the supply registers. It may be noted from Table 2, which shows a typical calculation sheet, that the introduction of a correction to the register air temperature to account for the heat loss in the ducts does not involve much additional labor in designing a duct system. In fact, the slight amount of work involved will be justified by the better results that will be obtained when the plant is installed and the adjustments in the dampers are being made. In the typical example shown in Table 2 it is assumed that four ducts, indicated by A, B, C, and D, are under consideration. For purposes of illustration it is assumed that each duct is supplying the warm air to four separate rooms, each having a heat loss amounting to 10,000 B.t.u. per hour. In addition, it is assumed that the total equivalent lengths of the ducts and stacks are 16, 30, 46, and 22 feet for ducts A, B, C, and D, respectively.

When the value of the air volume delivery at each of the registers has been obtained, the procedure is the same as that ordinarily used and consists in the determination of register sizes, duct sizes and fan size. The

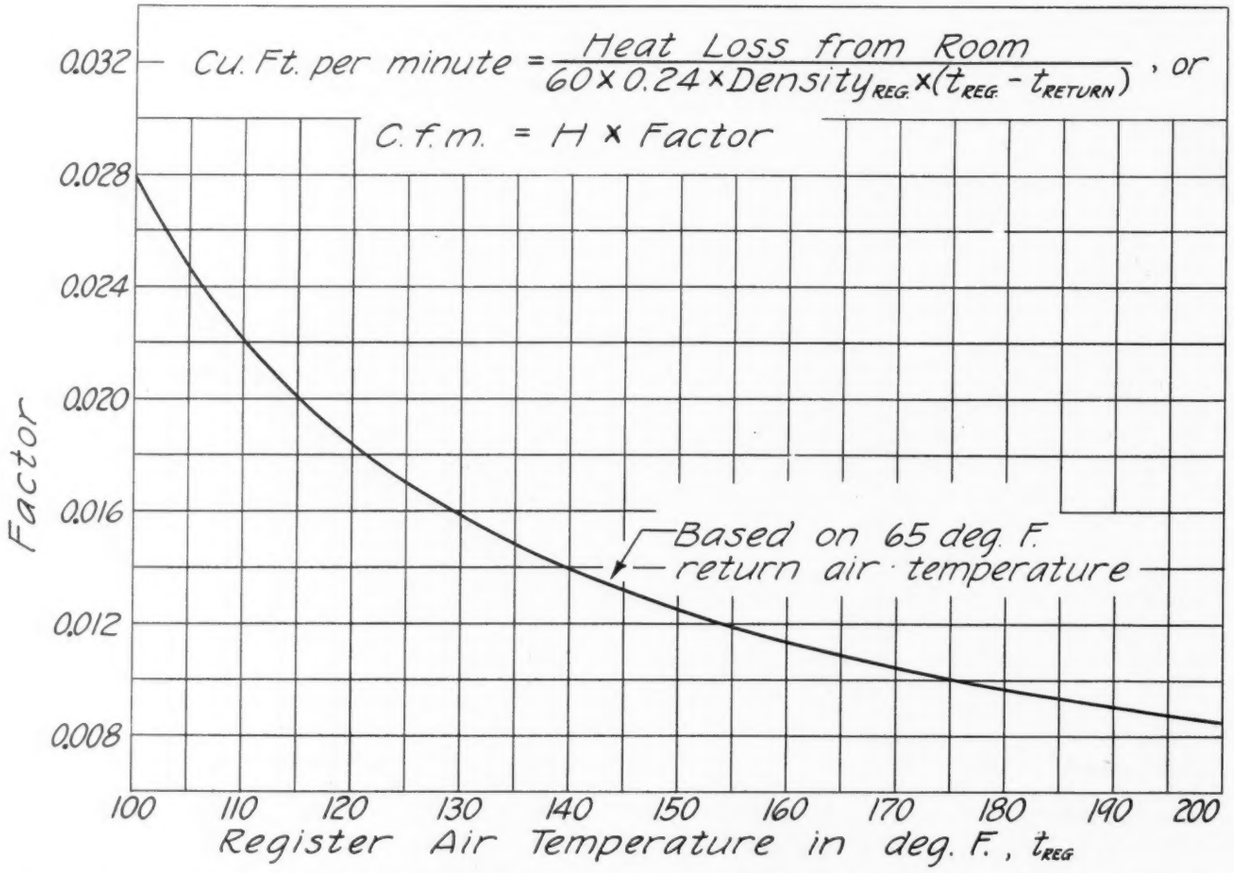


Fig. 1—Values of factor to be used in the equation: c.f.m. = H × Factor. Note that the value of the factor is dependent on the register air temperature.

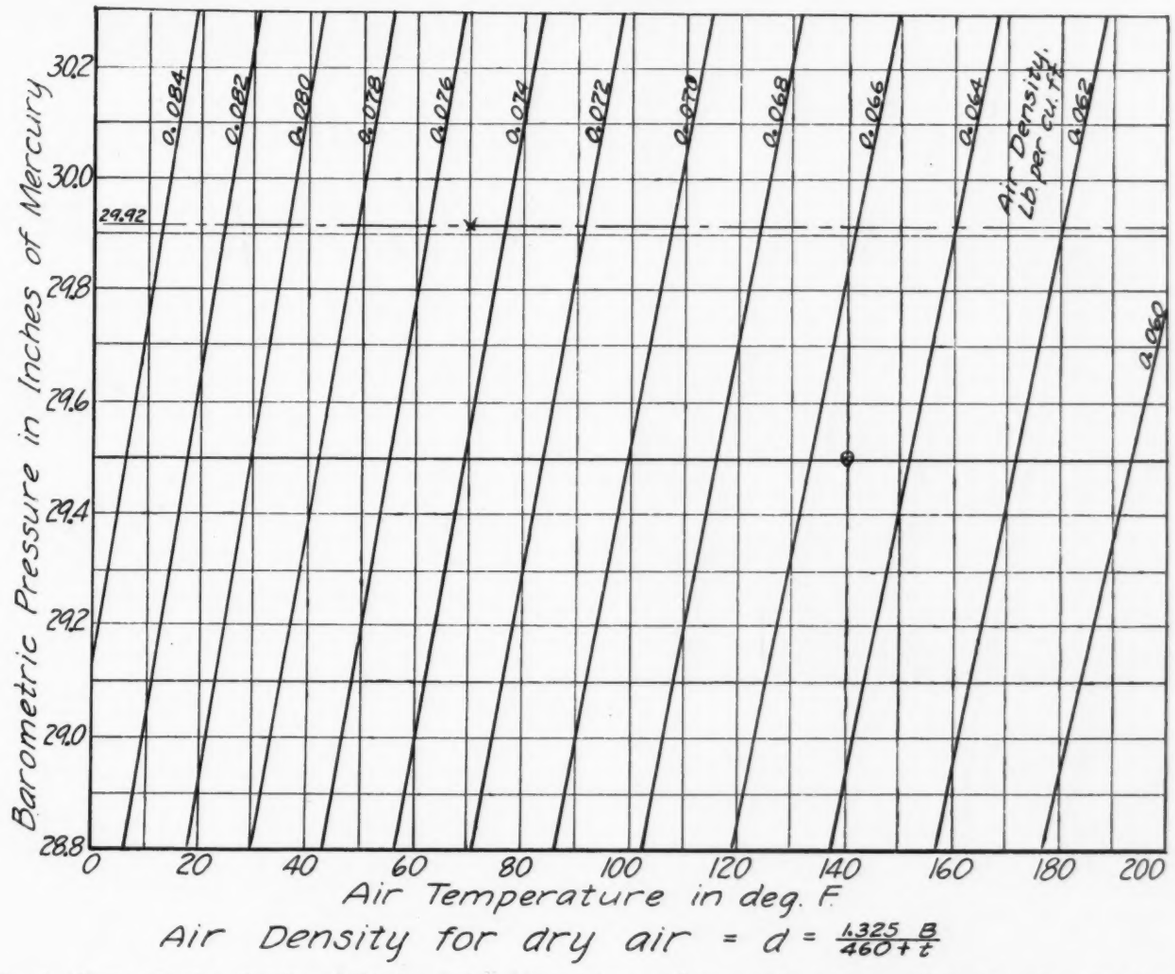


Fig. 2—Curves showing Density of Air for various temperatures and barometric pressures. (Values based on dry air and determined from equation, $d = \frac{1.325B}{460+t}$)

TABLE 2

Typical Form Sheet for Calculating Air Volumes at Supply Registers

(In this example, the bonnet air temperature is assumed as equal to 150 deg. F. and the temperature drop per foot of duct is assumed as equal to 0.5 deg. F.)

See values in Fig. 1 and Table 1.

Duct	Heat Loss Btu/hr.	Equiv. length foot	Temp. drop (0.5 per foot)	Reg. Temp.	Factor from (Fig. 1)	Required C.f.m. at Register
A	10,000	16	8	142	0.0137	137
B	10,000	30	15	135	0.0148	148
C	10,000	46	23	127	0.0165	165
D	10,000	22	11	139	0.0140	140

details of such calculations will be given in a later article.

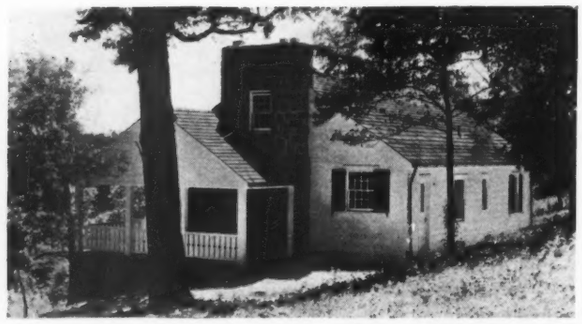
The Factor "55"

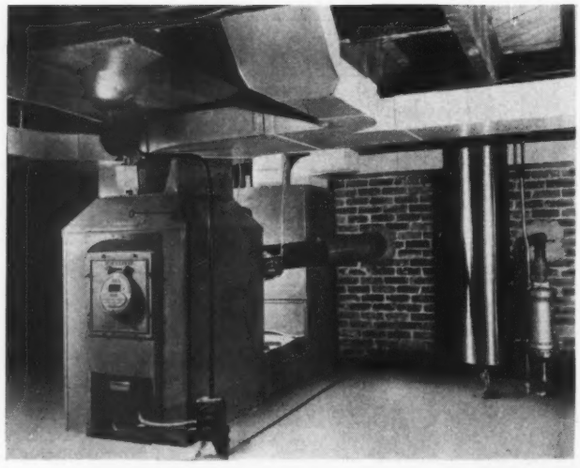
In this connection it should be noted that the values obtained from the calculations for the volume of air delivered at the supply registers are for a density of air corresponding to the register air temperature. Since the density of the warm air supplied to the registers is less than the density of the cooler air handled at the fan, the sum of all the separate *volumes* of air handled at the supply registers will not correspond exactly with the total *volume* of air that is handled by the fan, although the weight of air handled at the two points is the same in magnitude.

For example, in Table 2 the sum of the air volumes delivered at the registers A, B, C, and D equals 590 cu. ft. of air per minute, and the total weight of air is equal to 2,362 lb. per hour. The same weight of air, amounting to 2,362 lb. per hour, is handled by the fan at a temperature of 65 deg. F. if no leakage of air occurs between the fan and the supply registers. However, since the air is more dense at the fan than at the registers, the total volume handled by the fan is less, amounting to 525 cu. ft. per minute instead of 590 cu. ft. per minute. The difference in air volumes as calculated at the two points is of the order of 11 per cent in this example.

In other words, the air volumes as calculated by the methods shown in Fig. 1 and Tables 1 and 2 apply only to those cases where the *warm* air is being handled. Therefore, the c.f.m. values listed in Table 2 may be used in calculating the sizes of registers and duct sizes. Theoretically, it would be considered proper to modify

(*Continued on page* 66)





From top to bottom—Exterior of second house built (has zone distribution for heating and cooling). Exterior of first house, no zone control; occupied by the builder. Heating and conditioning system of first house; compressor and coils in back of oil burning furnace. Living room of first house showing high sidewall registers and baseboard returns.

'Year Round Air Conditioning in $7,500 Houses

In how low a price class can we put winter or summer or year 'round air conditioning? Some say $5,000; others $10,000; some $20,000. Speculative builders may be the key to the answer. This builder placed year 'round conditioning in $7,500 houses and found public reaction favorable.

A VERY interesting development in year-round air condition for small, moderately priced houses, indicating what can be done in the way of supplying complete comfort in the moderately priced house and furnishing some indication of the percentage of conditioning equipment cost to the total cost of the house is illustrated by two residences built by F. G. Bishoff, in Braddock, Pennsylvania, near Pittsburgh.

Mr. Bishoff selected a tract of some eighty acres along the Wm. Penn highway, a short distance above Wilkinsburg, and instructed his architect to erect two houses as the first of a group of small model homes completely equipped with all modern conveniences and including a complete central system of year-round air conditioning. The houses built and planned ranged between $7,000 and $8,000, this cost including the year-round air conditioning system. Each home in the future development is to have one acre of ground, fronting on Wm. Penn Highway and the tract will have a recreational park including a swimming pool. To advertise the development, Mr. Bishoff erected a 42-foot billboard along the highway, featuring the installation of air conditioning.

The Apparatus

The contractor and manufacturers of apparatus furnishing the systems were W. J. Keist and Son of Westview, Pennsylvania, the heating contractor, and the York Ice Machinery Corporation furnishing the cooling apparatus. The heating plant in the first house consists of a Waterman-Waterbury seamless oil-burning furnace with a rotary Timken-Silent Automatic oil burner, firing at the rate of one gallon per hour. The blower and filter unit is the Waterbury Comfortrol which delivers 1,000 cfm against ⅜ inch static pressure, and uses three dry cleanable type filters. The compressor is 1½ hp. Freon is the refrigerant, and the condensor is water cooled, with a cooling coil.

The first house completed proved so attractive that Mr. Bishoff decided to move his family into the resi-

dence. The house has a total volume of 5,200 cu. ft. It is interesting to note that the cooling system cost approximately $745.

The second model house erected consists of five rooms and a bath with a total of 7,300 cu. ft. all air conditioned, has a 1-hp. compressor as compared to the 1½ hp. unit in the first house and has a zone system of air distribution and control. The second house has a Pennsylvania gas furnace and a York air conditioning coil and compressor.

Zone Control—Pipe Sizes

In the second house, by means of zone control, the central system is arranged to cool the living and dining room during the day time and cool the bedrooms at night. This effected such a reduction in total cooling load that Mr. Bishoff selected the 1 hp. compressor as compared to the 1½-hp. in the first house which does not have zone distribution.

Both houses are insulated with four inches of rock wool in all walls and the ceiling to further reduce the cost of winter and summer conditioning. No awnings are used at the windows of either house and only single windows and doors are employed in the winter time in both houses.

Contractor Keist reports that—"After the heating system was designed for the first house the heating layout was checked by York before duct work was installed in either house. It was found that the heating duct sizes should be enlarged to the rooms where cooling was desired. This reduced the velocity for heating to approximately 500 ft. per minute, while the velocity for cooling is just above 800 feet per minute. The heat loss of the first house is 41,000 Btu at a 90 deg. temperature difference.

"More attention was given to the design and sizing of the ducts and the capacity of the blower for the cooling operations than for the heating, since 1,000 cfm was needed for cooling and only 600 cfm for heating. The blower, consequently, operates at the same speed for both heating and cooling, which we feel reduces unnecessary service calls to change blower speed."

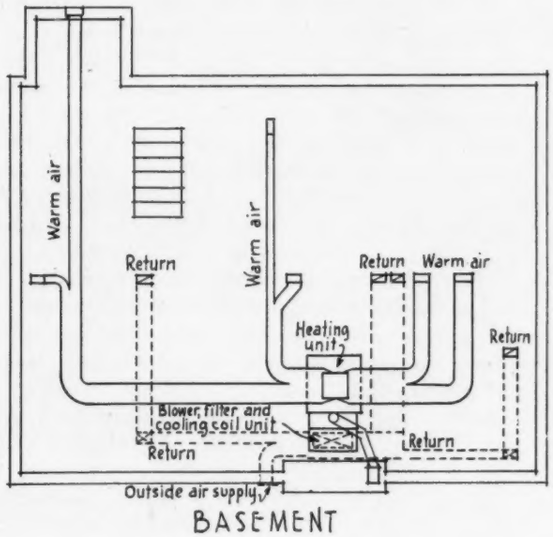
"The grilles for heating and cooling are installed 7 feet from the floor line with the cooling coil placed between the filter and the blower to avoid the possibility of any dust collecting on the coils from the moisture in the air as it condenses. This, we feel, increases the coil efficiency.

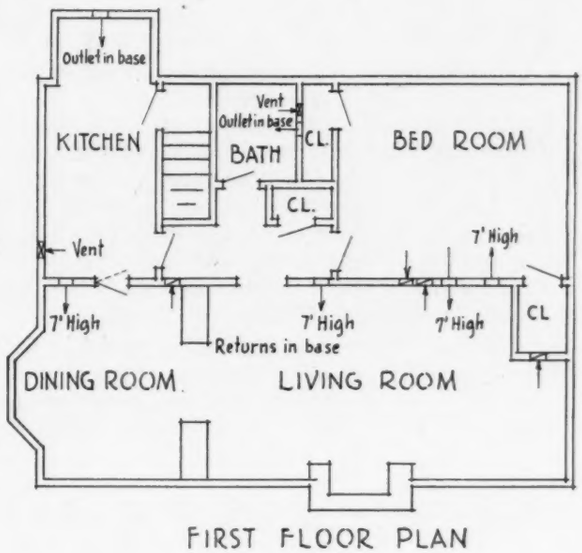
Bedroom of first house showing register 7 feet above floor. Return is almost under register. See floor plans below.

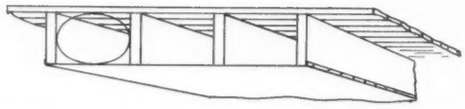
Control Operation

"In the first house, which does not have zone control and distribution, the heating unit is controlled by a thermostat, located on the first floor. The thermostat operates the oil burner while the blower is controlled by a combination bonnet and limit control set at 135 and 250 deg. respectively. Under winter operation, the thermostat calling for heat starts the oil burner and when bonnet temperatures reach 135 deg. the blower starts. When the thermostat is satisfied, the burner turns off, the blower continuing to run until the bonnet temperature again reduces below 135 deg. when the blower stops. Should bonnet temperatures exceed 250 deg., the burner is cut off, but the fan continues to run.

(*Continued on page* 52)

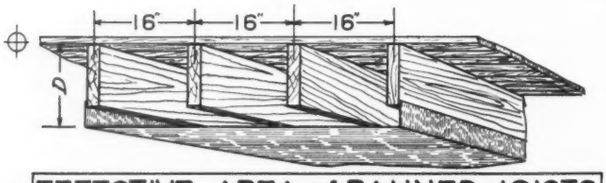






JOISTS Nominal Dimensions Inches	JOISTS Actual Dimensions Inches	Total Free Area Sq. Ins.	Effective Area Sq. Ins.
2x8	1⅝x7½	108	85
2x10	1⅝x9½	136	107
2x12	1⅝x11½	165	130

Fig. 1—The actual effective areas of commonly spaced joists.



EFFECTIVE AREA of PANNED JOISTS Square Inches				
Depth "D"	ONE Joist Space	TWO Joist Spaces	THREE Joist Spaces	FOUR Joist Spaces
8	88	176	264	352
9	99	198	297	396
10	110	220	330	440
11	121	242	363	484
12	132	264	398	528
13	143	286	429	572
14	154	308	462	616
15	165	330	495	660
16	176	352	528	704
17	187	374	560	748
18	198	396	594	792
19	209	418	627	836
20	220	440	660	880

Fig. 2—The effective areas of commonly spaced poists when we pan down to increase the working area.

◆ ◆

As pointed out in the preceding article of this series (May, 1936 issue), the addition of a blower of adequate capacity greatly improves the heating results by compelling the circulation of double the volume of air which formerly flowed by gravity. The suction created by the blower likewise permits return air to be drawn through more and longer ducts than is possible by gravity circulation, and unless structural features of the building prevent return air faces can be placed in practically all rooms.

While we are improving the heating results by such extensions of the return air system, we should at the same time use reasonable care to prevent unnecessary waste of electric current to drive the blower, by guarding against EXCESSIVE and avoidable frictional resistance in the ducts. Aside from abrupt square turns in cold air ducts which it is assumed the installer will try to avoid, perhaps the principal sources of

Converting Old Gravity Systems To Forced Warm Air

Carelessness in figuring the area between joists for returns often leads to trouble. For instance, the contractor may measure the center to center dimension of joists and forget that this is not a measure of effective area. The result is high friction loss, restricted area, poor air flow. Let's chart, therefore, the actual areas we work with.

By G. A. Voorhees
Chief Engineer, Blower Division
Schwitzer-Cummins Co.

avoidable friction pressure losses in the return air side of the system, are panned joist spaces and unlined studding spaces used to carry return air.

There are two reasons why such spaces deserve special attention from the pressure loss (frictional resistance) standpoint: (1) any rectangular duct offers greater resistance to air flow than a round pipe having the same cross section area; (2) a duct, one or more sides of which are of wood or rough lath and plaster, offers much more frictional resistance than a rectangular metal duct of the same dimensions.

In designing a completely new duct system by the "friction pressure loss method." we must (and do) give careful attention to the important fact that *for a given cross sectional area* the frictional resistance of a rectangular duct is measurably greater than for a round pipe. Even in using the simpler "velocity method" of sizing the ducts, the careful designer usually makes an arbitrary increase in the cross sectional area of a rectangular duct beyond the area which he would specify for a round pipe to carry the same air volume.

The reader who is interested in the precise methods of determining rectangular equivalents of round ducts for equal friction, will find articles dealing with the subject in past issues of the AMERICAN ARTISAN (S. Konzo—July, August, September, October, December, 1935) and a convenient table of such equivalents in the Mechanical Warm Air Heating Code, a copy of which may be secured from the Editor.

Our present interest is in approximate methods suitable for application to the remodeling of old gravity

plants where existing warm air leaders will probably be retained or modified only slightly, but where we may need to provide a number of additional cold air returns —*and at a minimum of cost.*

Unlined Stud Spaces

The use of *unlined* studding spaces to bring return air down from second floor rooms is not recommended when an installation is being made in a new house. The rough plaster keys back of the lath seriously retard free air flow through such spaces because of the excessive frictional resistance and air turbulence which they produce. Further, the suction effect of the blower maintains a lower air pressure in all return ducts than the normal air pressure in the rooms. Consequently, there is a continuous slow seepage of room air through the plaster (in the spaces between the laths) from the room into the unlined studding space used as a return air riser.

The plaster acts as a most effective filter; the air passes through leaving minute dust particles embedded in the outer surface of the plaster or on the wallpaper and we eventually see a series of horizontal dark streaks on that part of the wall opposite the studding space where the return air is flowing. These streaks

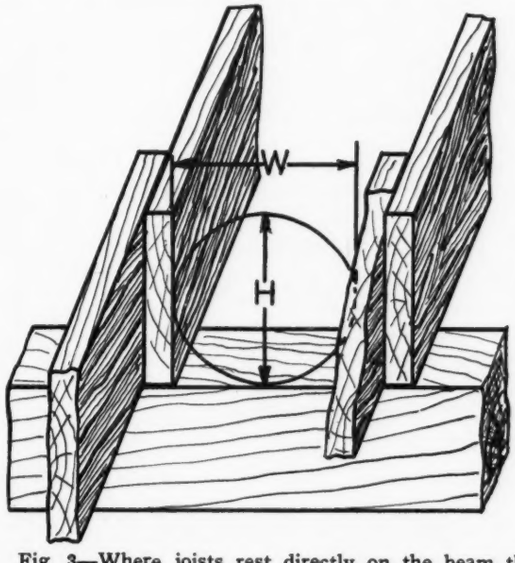


Fig. 3—Where joists rest directly on the beam the overlap may be as shown here. This often becomes a bottle neck for the careless contractor.

mark the spaces between the laths where the seepage is taking place.

In new construction or in old houses which are being remodeled so the installer can have ready access to wall spaces where return air risers are to be placed, it's best to install metal ducts for such returns. The next best practice is to nail sheets of galvanized iron across the studding spaces where return air is to flow, before the lath is applied.

In revamping old jobs where neither of these suggestions can be used, and where it is desirable to bring cold air down through studding space from second floor rooms, *ample free area should be provided so the air can flow at low velocity.*

For the same reason, a lower air velocity is desirable in panned joist spaces than is permissible in a round metal pipe.

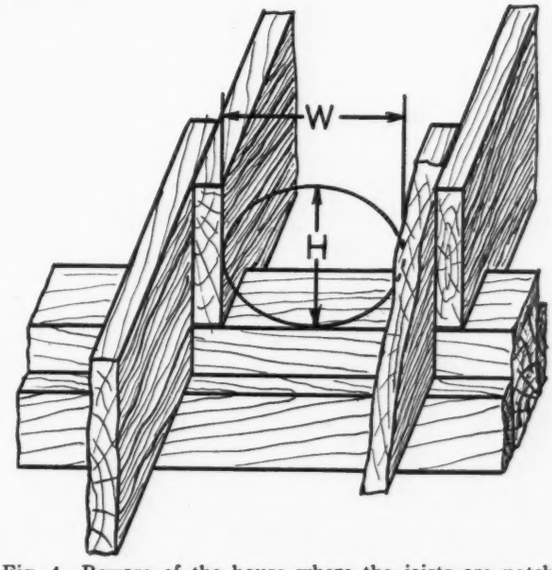


Fig. 4—Beware of the house where the joists are notched out and have overlapping ends resting on a high point. This further restricts the effective area.

Regardless of whether we are using the precise friction pressure loss method of sizing ducts, or are relying on codes or rules of thumb, frictional resistance is reduced by increasing the cross sectional area of the duct and thereby lowering the air velocity. This is based on the fixed law that "frictional resistance varies as the square of the velocity." The precise friction pressure loss method of proportioning ducts takes certain other factors into consideration also, and they are embodied in the conventional types of friction pressure charts used for such duct design, (Voorhees, June, 1936) but our present interest is in simpler and more practical methods to apply to the remodeling or conversion of the *average* gravity plant into a mechanical system. It is perhaps sufficient to say that when the air velocity is reduced 50% (by doubling the cross sectional area of the duct or ducts) the friction pressure loss is reduced 75%—and the suction effect which tends to produce horizontal streaks on the walls where unlined studding spaces are used for return air risers, is similiarly reduced.

The important thing to remember is that we can reduce the frictional resistance to air flow in unlined studding spaces and panned joists by making the areas

(*Continued on page* 54)

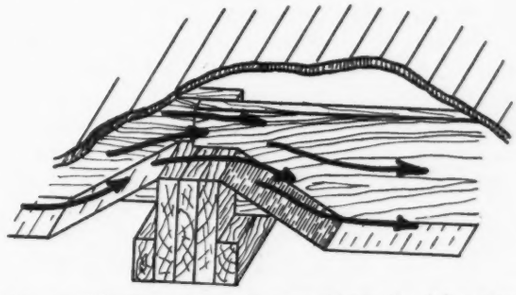


Fig. 5—When you have to pass above the joist give the air a little "takeoff" and a slide along which to regain momentum.

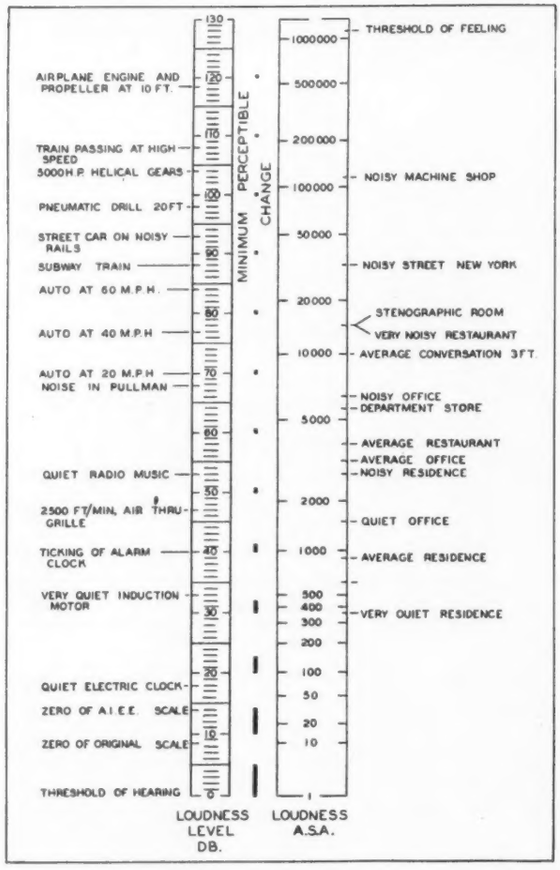


Fig. 1.—Comparison of Loudness Scales. The short line segments in the center show the smallest change in loudness which can be perceived.

Noise Problems of Forced Air Installations

By P. H. Geiger
Research Physicist,
Department of Engineering Research,
University of Michigan

PROBABLY most contractors installing forced air heating or air conditioning equipment have had occasional complaints from customers in regard to the noise made by the equipment. Oftentimes these complaints seem unjustified, because other installations, almost identical, give perfect satisfaction. However, even a small percentage of dissatisfied customers is not wanted. Since a quiet installation may mean an increase in costs information as to the method of predicting the noise before work is begun, will be of value to all contractors.

For public and semi-public buildings, architects' specifications calling for noise levels below a specified value, are becoming more and more common. The object of this article and the one to follow, is to present information enabling a contractor to design an installation so that it will be satisfactory from a viewpoint of noise, and still involve no unnecessary expense.

The common idea that there is a certain air velocity, which, if exceeded, will greatly increase noise is wrong.

The truth is that very low velocities produce noise, which increases more or less regularly as the velocity increases. For bedrooms in a residence in a quiet district, or for high grade broadcasting studios, very low velocities are required, whereas for other locations much higher velocities can be used without making sufficient noise to be heard over the other noises already existing in the room. If one should set a value of velocity which would be satisfactory for any installation, he would find even then that all of his difficulties were not solved, for different types of grilles make different amounts of noise for the same velocity.

Method of Specifying Loudness

There are several ways by which the loudness of sounds are specified. The most convenient scale to use for making computations is the American Standards Association Loudness Level scale. This is a decibel scale, and is now the only one officially recognized. Although this scale is simple to use in making computations, it does not, in some ways, present true comparisons between sounds.[1] For example, if one noise has a loudness level of 100 decibels, a noise which most people will declare to be half as loud, will have a rating of 90 decibels instead of 50 decibels as might be expected.

When it is desired to compare the loudness of two sounds it is preferable to use another scale, such as the A. S. A. Loudness scale,[2] for this scale rates noises as they are heard. The advantage of the A. S. A. loudness scale over the decibel scale may be seen by the following example. The noise inside the body of a certain quiet, high priced car, may be compared with the noise of a low priced car. Anyone riding in these two cars could not fail to note the great difference, yet, at fifty miles per hour one measured 76.5 decibels and the other 84.2 decibels. The difference between 76.5 and 84.2 decibels does not sound very striking to one unacquainted with the decibel scale, but when the loudness values are given as 13,000 and 23,500, as they are expressed on the loudness scale, one gets a true impression of the difference.

In order to give an idea of the loudness level (decibel) scale and the loudness scale, Figure 1 has been prepared. This chart shows the loudness values at typical places and of typical machines. The location of the zero values of two other decibel scales are shown on the chart. These values will enable one to change from one of the old decibel scales to the new, official, scale, for it is only necessary to add the value shown on the chart to the value one wishes to convert. The heavy line segments

[1]Geiger and Firestone, "Estimation of Fractional Loudness." Journal Acoustical Society of America, Vol. V, No. 1, p. 25.

[2]The loudness level scale is a decibel scale; the loudness scale is not. A.S.A. Committee Report. Journal Acoustical Society of America, Vol. V, No. 2, page 109.

in the center of the chart represent the least change in loudness which can be detected by the average person under the best of conditions. It will be seen that a change of five decibels is barely perceptible for very low noise levels, whereas a change of about 0.3 decibel is noticeable for noise levels of 80 decibels or over.

The decibel scale will probably seem strange when one first starts to use it, but actually it should be no harder to use than is the Fahrenheit temperature scale.

Noise of Air Through Grilles

Figure 2 shows how the noise made by air passing through three typical types of grilles varies with velocity.[1] The American Standards Association Loudness Scale was used for this curve in order to bring out the differences between different grilles. Grille A was a type equipped with vertical fins, placed to give a large spread. Grille B was a honeycomb type giving a small

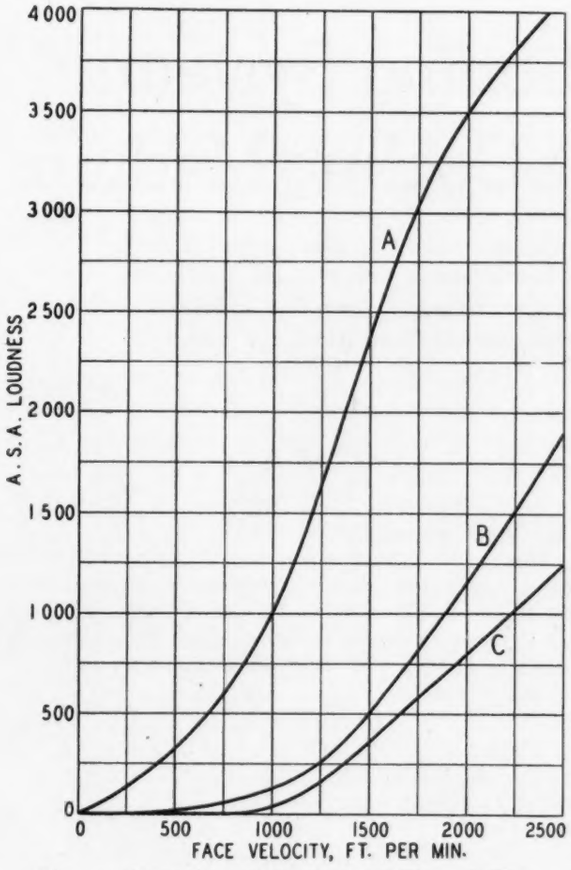


Fig. 2.—Comparison of Loudness of Three Grilles.

spread. Grille C was a plain perforated grille, such as often used for return air intakes. Figure 1 demonstrates why it is not possible to set a definite upper limit to the velocity, for a grille like C will permit the use of a velocity over double that of a grille like A for the same amount of noise.

The data of Figure 2 are plotted in Figure 3 in terms of decibels. These curves furnish the basis for computing the loudness produced by any velocity of air, through any size grille, in any room.

The three curves of Figure 3 may be considered typical of the three types of grilles described, but since grilles of different manufacture, even with very similar air throw patterns, produce different amounts of noise, it will be necessary to obtain data from the grille manufacturer if accurate estimates of noise are required.

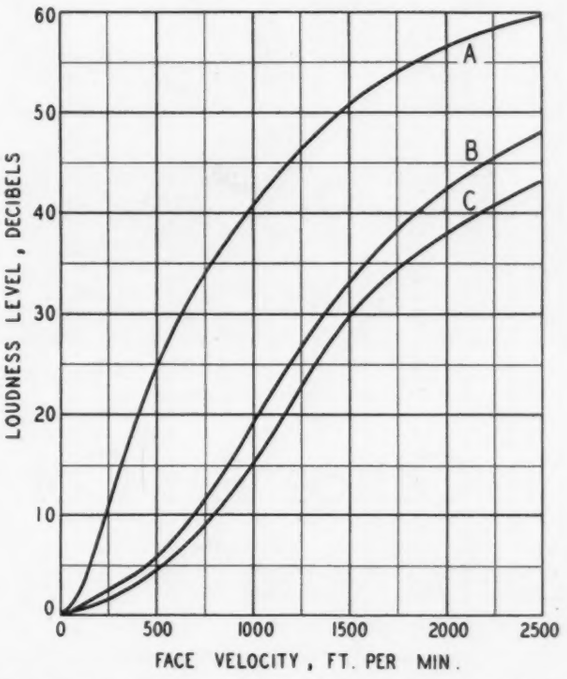


Fig. 3.—Loudness of Three Grilles, plotted on a decibel scale. These curves are the basic curves for computing noise.

Correcting Different Size Grilles

The curves of Figure 3 are for grilles having an area of one-half square foot. To find the loudness level (that is, the decibel rating) of grilles having other areas, Figure 4 may be used. This curve[1] gives the number of decibels to be added or subtracted from the value obtained from Figure 3, or a similar curve supplied by the grille manufacturer. [Fig. 4 is on page 57.]

Figure 4 shows that each time the grille area is doubled, the grille noise increases by three decibels. The noise of a grille of one square foot area is three decibels greater than that of a grille of one half a square foot; two square feet is six decibels greater; four square feet is nine decibels greater and so on.

Fig. 4 is plotted on the basis that the velocity is the same through the grilles, regardless of their size. That is, the loudness level of a large grille is greater than that of a grille of one half square foot area, *with the same velocity,* by the amount of the correction given by Fig. 4. The statements in the preceding paragraph therefore hold true only when the same velocity air flows through

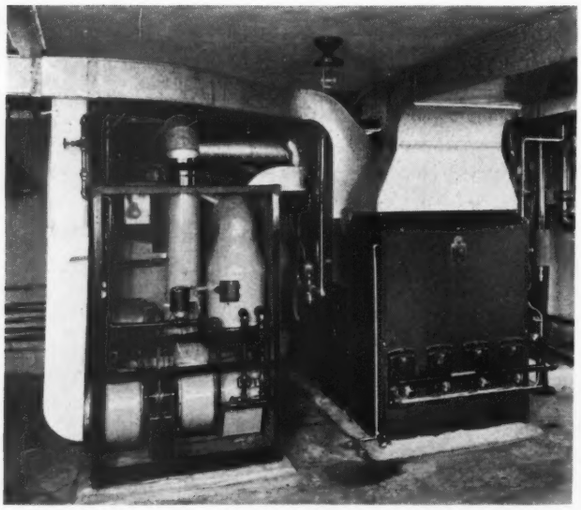
[1]The data given in Figures 2 and 3 were selected from a large number of curves obtained in a study of grille noise made by the Physics Division of the Department of Engineering Research at the University of Michigan. This work was sponsored by the Hart and Cooley Mfg. Co., whose consent has been given for the publication of this paper.

[1]The equation for the correction curve is given by the relation

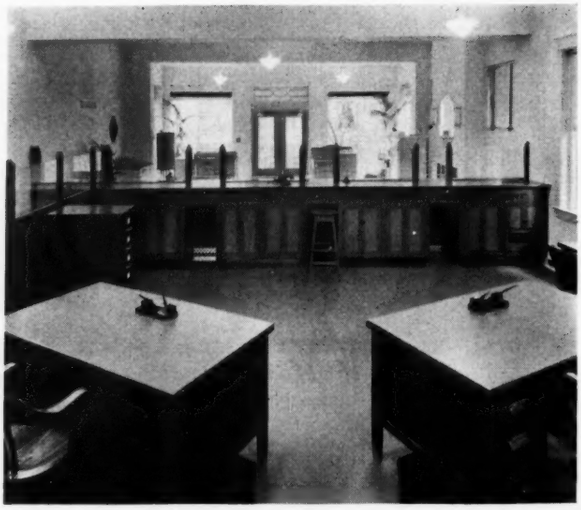
$$\text{Correction} = 10 \log_{10} (A/0.5)$$

where A is the area of the grille in square feet.

(*Continued on page 57*)



The gas-fired furnace and, at left, the Silica Gel drying unit which controls amount of moisture in air.



View of office showing high supply register in left wall, winter supply in counter at right.

Office Air Conditioning System Employing Drying as a Cooling Medium

"If the air is dry, you don't mind the temperature," is often cited as the reason why people can live in arid, hot climates. How much truth there is in the assertion may be open to argument, but this article describes a cooling system in which this method was tried out with interesting results.

OBTAINING summer comfort by reducing indoor relative humidities has for several years been one of the methods propounded by the air conditioning industry. In the Greensburg office of the Peoples Natural Gas Company of Pennsylvania a system in which the air can be dried and circulated in large quantities; can be cooled by tap water and circulated; or can be both dried and cooled and circulated—all operations being independent of the others—has been in operation through two summers. The results obtained by arbitrarily operating with one or more functions cut off furnishes some measure for judging just what comfort conditions can be obtained.

Plan of Apparatus

The plant consists of a No. 4-F-76 Bryant winter air conditioner in combination with a No. 10 (1000 C. F. M.) Bryant silica gel dehumidifier. Standard heat transfer coils are used for the sensible heat removal; using city tap water of 70 degrees F. as the cooling medium. A galvanized iron distribution system of supply and return ducts is used for summer as well as winter. The supply outlets were so designed as to provide base registers for winter; with wall registers, seven feet above the base, for summer distribution.

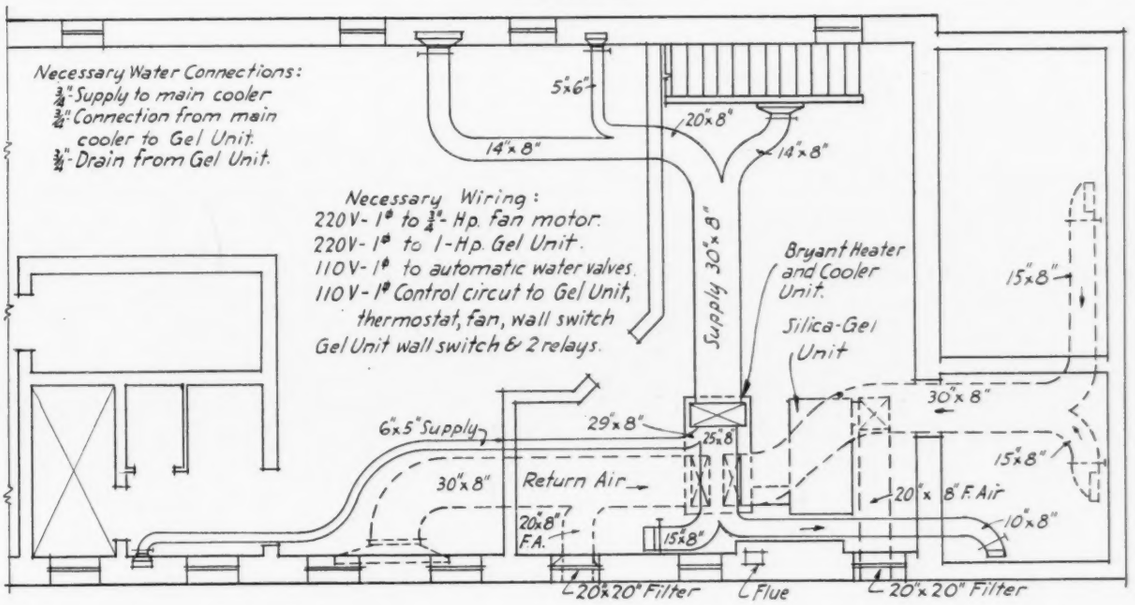
The photograph of the office conditioned shows one of these summer supply registers near the top at the left side; and also shows a winter outlet in the lower part of the counter at the extreme right. The control panel is also shown a little below and to the right of the summer register first referred to.

This control panel which houses the three instruments required to operate the system is located about five feet from the floor line. A master switch to throw the summer equipment on or off is also located on the panel. There is a No. 40 Minneapolis-Honeywell thermostat to control the gas supply for winter heating and a No. T-62-3 thermostat, having a range of 70 to 90 degrees F. for summer use. A humidistat for controlling the indoor relative humidity, both winter and summer, completes the controls.

What the System Does

The entire plant is fully automatic and responds definitely to all changes in atmospheric conditions. For winter, it heats, circulates, filters and humidifies the air. For summer it cools, dehumidifies, circulates and filters the air. The system also ventilates the building; there being a fresh air intake as shown on the plans.

This system differs from the ordinary cooling plant in which refrigeration or compressor systems must first cool the air to be conditioned below the dew point of the room air in order to precipitate out some of the excess moisture and thus lower the relative humidity.



Piping arrangement in basement showing connection to drying unit to adjust recirculation or outside air supply.

This dew point is far below the temperature at which the air can be introduced in to the rooms to be conditioned, being usually about 45 degrees F.; whereas the air introductary temperature should be from 65 to 70 degrees minimum. So in the compressor system this air must be reheated before it can be delivered; or some outside or recirculated air mixed with it to accomplish the same purpose. It costs money to cool below the required temperature and then reheat or bypass.

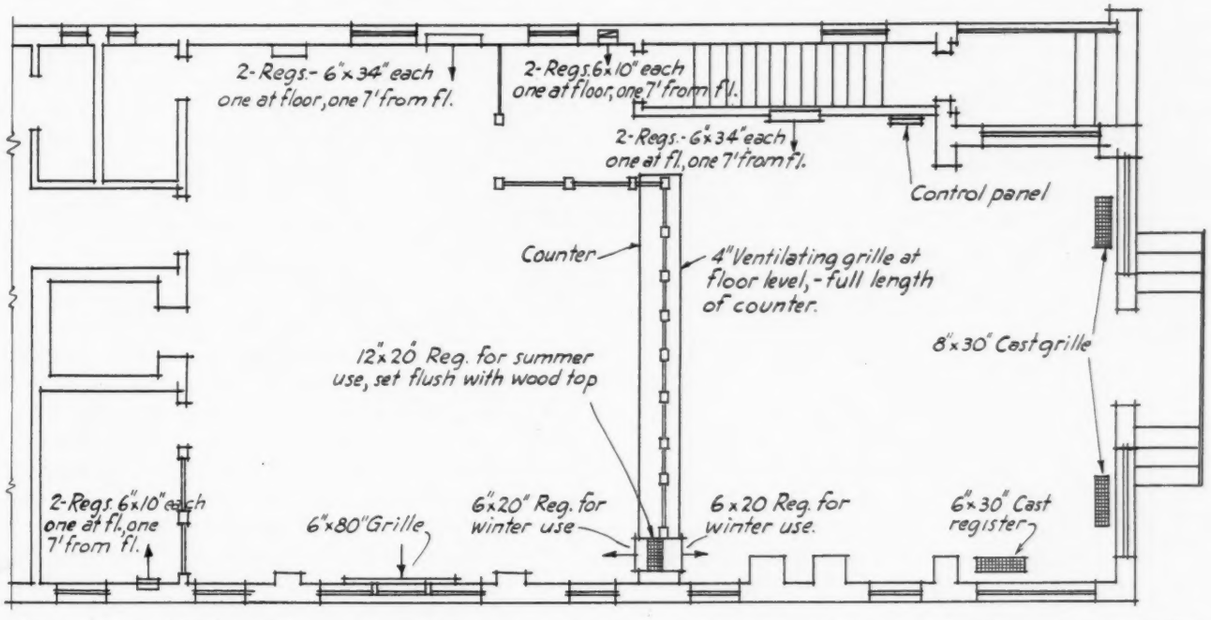
The silica gel system used in this job removes the excess moisture in the air by absorption; in much the same manner as a blotter absorbs ink. The entire latent heat correction required is made in this manner; and since the latent heat is the true measure of comfort or discomfort, such corrective treatment accomplishes to all intent and purposes the results desired for comfort air conditioning. If any sensible heat removal is required in addition, this can be done most economically and simply by means of tap or well water (if available) up to 70 degrees F. The cost of the water required depends on the temperature of the water used.

Operating details of this job are as follows:

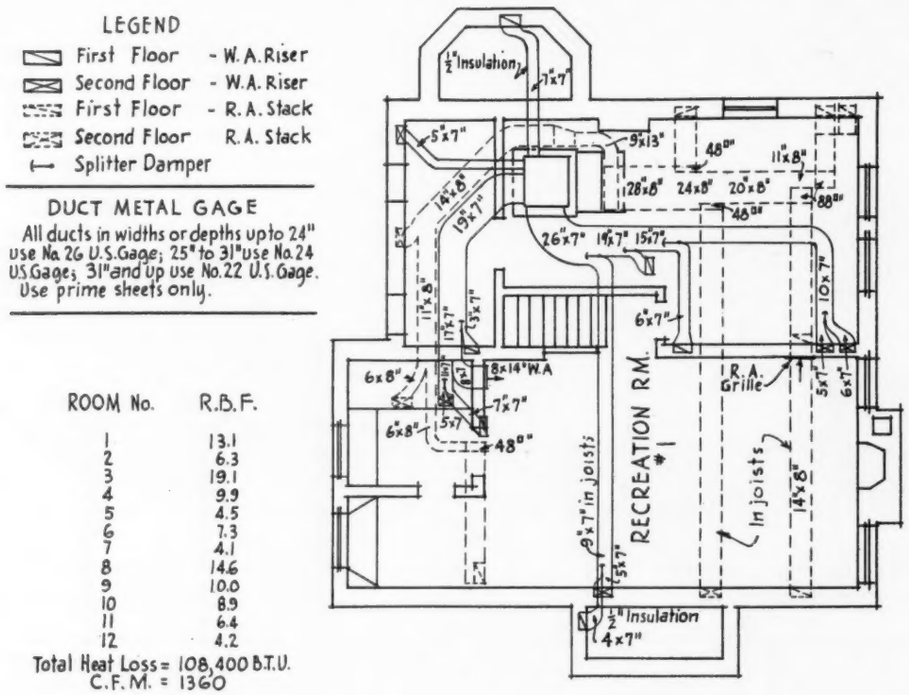
Fresh air at the rate of 1000 C. F. M. is taken through the Gel machine. This is mixed with 1200 C. F. M. of recirculated air to make a total of 2200 C. F. M. handled by the blower. The total air volume is passed through the main cooler, where its temperature is lowered to within 5 degrees of the water temperature.

The Silica Gel unit may be operated independently of the cooler or vice versa. Under certain atmospheric

(*Continued on page 60*)


2-Regs.-6"x34" each one at floor, one 7' from fl.
2-Regs. 6"x10" each one at floor, one 7' from fl.
2-Regs.-6"x34" each one at fl, one 7' from fl.
Control panel
Counter
4" Ventilating grille at floor level, - full length of counter.
8"x30" Cast grille
12"x20" Reg. for summer use, set flush with wood top
2-Regs. 6"x10" each one at fl. one 7' from fl.
6"x80" Grille
6"x20" Reg. for winter use
6 x 20 Reg. for winter use.
6"x30" Cast register

Plan of office showing double supply registers—upper for summer; lower for winter—and location of return grilles.



"Cost Per Pound" or "Price Per Opening" Which Is the Way to Estimate Pipe Cost

By Eugene P. Farris
Managing Director
Central Bureau for Heating and Air Conditioning, Cleveland

THE common type house around the city of Cleveland is a six or seven room house, and there are quite a number of them built. The basement plan is cut up into different rooms, like your group room, etc., your cool room and a recreation room, comes down something on this order. Our first floor consists of a living room, dining room, kitchen, and enclosed porch. The second floor has three bedrooms and a bath.

We will start at the basement first and take off our poundage in the basement. I have heretofore always taken and started one run and finished that completely in the basement, start what I call No. 2 run and finish that completely, from my plenum chamber to my risers. Then the No. 3 run; then No. 4. Then I start on my return ducts and start from my gathering chamber and catch each branch trunk line and each branch as we come to it, following one run straight through so that you are sure you don't miss any of the material that is required on the job. So we will start with the plenum chamber first.

Ordinarily the furnace will run from five to five and a half feet high. This basement is seven feet high. The plenum chamber is 36″ by 30″ on top of the furnace, 24 inches high with a solid top (A1). Our gauges of iron—22 gauge for your plenum chamber, and this table of gauges is what the bureau has been specifying. All ducts in width or depths up to 24 inches use No. 26 U. S. gauge. The 25 inch to 31-inch use No. 24 U. S. gauge. The 31-inch and up use No. 22 U. S. gauge. On air conditioning jobs we specify that only prime sheets shall be used.

The 30 by 30 by 24-inch high plenum with a solid top, opens into No. 1 run through a 26″ by 7″ trunkline (B1). That is really a 90-degree elbow. It is one fitting, that is, 26″ by 7″, and that measures through the center to the point of the first take-off, is five feet, is 24-gauge iron. The balance of our duct on that particular run is 26-gauge.

We have our next run starting right in here, 9″ by 7″, catching two risers, one to the second floor and one to the third floor (C1). That 9″ by 7″ duct to the boot and riser at the end measures 21 feet. The 26-gauge trunkline serves the vestibule on the first floor and bedroom No. 8 on the second floor.

The branch to the vestibule is 4″ by 7″. It is 3 feet around that elbow (C2). The 5 by 7-inch

BASEMENT SUPPLY DUCTS

Items	Material	Total Quantity
PLENUM CHAMBER		
A 1—36″x30″ by 24″ high plenum chamber with solid top—1 required	22 ga. galv. seams and waste	42 lbs. net 6 lbs. 48 lbs. gross
RUN No. 1		
B 1—26″x7″ ducts—fitting—1 5′	24 ga. galv. seams and waste	31 lbs. net 5 lbs. 36 lbs. gross
C 1—9″x7″ ducts—fittings—2 21′		
C 2—4″x7″ ducts— “ —1 3′		
C 3—5″x7″ ducts— “ —1 2′		
C 4—19″x7″ ducts— “ —1 3′		
C 5—5″x7″ ducts— “ —1 2′		
C 6—15″x7″ ducts— “ —1 2′		
C 7—6″x7″ ducts— “ —2 6′		
C 8—10″x7″ ducts— “ —2 14′		
C 9—5″x7″ ducts— “ —1 2′		
C 10—6″x7″ ducts— “ —2 2′		
RUN No. 2		263 lbs. net
D 1—19″x7″ ducts—fittings—3 14′	26 ga. galv. seams and waste	39 lbs. 302 lbs. gross
D 2—3″x7″ ducts— “ —1 2′		
D 3—17″x7″ ducts— “ —1 2′		
D 4—14″x8″ ducts— “ —1 3′		
D 5—11″x7″ ducts— “ —1 2′		
D 6—7″x7″ ducts— “ —2 4′		
D 7—5″x7″ ducts— “ —1 2′		
RUN No. 3		
E 1—5″x7″ ducts—fittings—2 8′		
RUN No. 4		
F 1—7″x7″ ducts—fittings—2 9′		

BASEMENT RETURN AIR DUCTS

Items	Material	Total Quantity
GATHERING CHAMBER		
G 1—30″x12″ by 30″ high gathering chamber with open top—1 required	22 ga. galv. seams and waste	24 lbs. net 4 lbs. 28 lbs. gross
RUN No. 1		28 lbs. net
H 1—28″x8″ duct—fittings—1 4′	24 ga. galv. seams and waste	4 lbs. 32 lbs. gross
H 2—24″x8″ ducts—fittings—1 3′		
H 3—20″x8″ ducts— “ —1 5′		
H 4—11″x8″ ducts— “ —2 3′-2′		
H 5—14″x4″ ducts— “ —2 3′		
H 6—11″x8″ ducts— “ —1 2′		
H 7—14″x4″ ducts— “ —2 5′		
H 8—14″x8″ ducts— “ —1 1′		
H 9—14″x4″ ducts— “ —1 6′		
H10—18″ girth joist filler and ends—57′	26 ga. galv. seams and waste	300 lbs. net 45 lbs. 345 lbs. gross
RUN No. 2		
I 1—9″x13″ ducts—fittings—1 4′		
I 2—14″x8″ ducts— “ —3 12′		
I 3—4″x8″ ducts— “ —1 2′		
I 4—11″x8″ ducts— “ —1 10′		
I 5—6″x8″ ducts— “ —2 3′		
I 6—6″x8″ ducts— “ —2 9′		
I 7—18″ girth joist filler and ends—10′		
FLUE PIPE		23 lbs. net
J 1—8″ round pipe—fittings—1 10′	24 ga. galv. seams and waste	3 lbs. 26 lbs. gross
SUPPLY RISERS		
K 1—10″x3½″ ducts—fittings—2 2′-2′		
K 2—12″x3″ ducts— “ —4 15′-11′		183 lbs. net
K 3—12″x3½″ ducts— “ —7 11′-2′-15′-15′	26 ga. galv. seams and waste	27 lbs. 210 lbs. gross
K 4—13½″x3″ ducts— “ —2 2′-2′		
K 5—13½″x3½″ ducts— “ —1 2′		
RETURN AIR RISERS		
L 1—13½″x3″ ducts—fittings—4 10′-1′-1′-10′	26 ga. galv. seams and waste	142 lbs. net 21 lbs. 163 lbs. gross
L 2—13½″x3½″ ducts— “ —6 10′-1′-22′-1′		
HANGERS AND REINFORCING		
M 1—On all ducts		101 lbs.
DUCT INSULATION		
N 1—Use ½″ air cell asbestos on exposed ducts as shown on plans	½″ air cell	142 sq. ft. net
VOLUME OR SPLITTER DAMPERS		
Use locking quadrant operation		
3″x7″ damper	18 ga. galv.	1
5″x7″ dampers	“ “	3
6″x7″ dampers	“ “	2
7″x7″ dampers	“ “	2
9″x7″ damper	“ “	1
11″x7″ damper	“ “	1
GRILLES		
Use stamped steel of plain lattice design and prime coat finish		
14″x6″ grilles		2
14″x8″ grilles		5
30″x6″ grille		1
REGISTERS		
Use stamped steel of plain lattice design and prime coat finish		
10″x4″ register		1
10″x6″ register		1
12″x6″ registers		2
12″x8″ registers		4
14″x6″ register		1
14″x8″ registers		3

The quantity take-offs shown above are reproduced from a prepared Survey Sheet adopted by the Cleveland Institute. The prepared sheet, in addition to the three columns shown, has spaces for "Detail," "Girth," "Price," "Total Cost." Each sheet measures 8½ by 14 inches.

riser (K3) goes to bedroom No. 8 on second floor. Make a notation of the number of fittings on this job. I will add them up when we finish to let you know just how many fittings are on a job of this type. That completes this particular branch.

Our next trunkline branch, which feeds dining room No. 4 is a 5″ by 7″ (C3). The 19″ by 7″ section of the trunkline (C4) opens into the first floor riser that feeds the dining room. The branch is 5″ by 7″, and is 2 feet long (C3). The trunkline which continues to the next take-off, is 15″ by 7″, and is 2 feet long (C6).

Our next branch feeds the living room No. 3 and is 6″ by 7″ and is 6 feet long (C7). This is taking the basement run to the first floor, in other words, taking our fitting to the riser.

Our next branch of the main trunk is 10″ by 7″ and catches two second floor risers is 14 feet long (C8). The first branch fitting is a 5″ by 7″ (bedroom 10) and the other a 6″ by 7″ (bedroom 9). The 5″ by 7″ is 2 feet (C9) and the 6″ by 7″ is 2 feet long (C10).

Now for our No. 2 supply duct in the basement. Start out with a trunkline, 19″ by 7″, (26-gauge as we haven't gone over 24-inch); we have 14 feet of pipe (D1). That is the trunk from the plenum chamber to our first take-off.

The first take-off is a 3″ by 7″ branch and elbow,

feeding to the lavatory on the first floor. The 3″ by 7″, is 2 feet long (D2). The trunkline continues 17″ by 7″, 2 feet long (D3). The next take-off is 8″ by 14″ (D4), feeding the recreation room and the trunkline continues with 11″ by 7″ dimension (D5). The 14″ by 8″ basement register for our recreation room requires 3 feet of pipe. The 7″ by 7″ is 4 feet long (D6). That riser feeds an additional heat to living room No. 3. Another branch catching this riser is 5″ by 7″, and feeds heat on second floor to bedroom No. 8, is 2 feet long (D7). No. 3 and No. 4 are individual runs to separate risers.

The trunk going to the second floor feeding heat to bathroom No. 11 is 5″ by 7″, 8 feet long (E1). The other trunk feeding the first floor kitchen (room No. 5), is 7″ by 7″ run, 9 feet long (F1). This completes our take-off in the basement of the supply ducts.

Perhaps it would be a good idea if I carried the take-off out into the poundage at this time and then continue with my return ducts.

For the benefit of simplifying the method of calculation we shall take the poundage of all the supply ducts in the basement and also the poundage of the cold air returns in the basement. At a later stage we will take the poundage from the riser or both heat and cold air returns.

The plenum chamber (22 gauge)—36″ by 30″ by 24″ high, that is 30 square feet net, in the plenum chamber. We have twice 3 is 6, and twice 2½ is 5, that is 11 feet around that duct. Two times 11 is 22 square feet, plus 2½ times 3 is 6 square feet, which gives us 30 square feet for our plenum; 22 gauge metal. Worked out in pounds would be—our fraction is 1.41, times 30—is 40 pounds. Your 22-gauge metal weighs 1.41 and we have 30 square feet, making a total poundage of forty-two pounds, net. Allow 15% for our seams, laps, and waste. Fifteen per cent of 42 would run approximately 6 pounds. We would have 48 pounds gross in our plenum chamber, of 22-gauge iron galvanized iron.

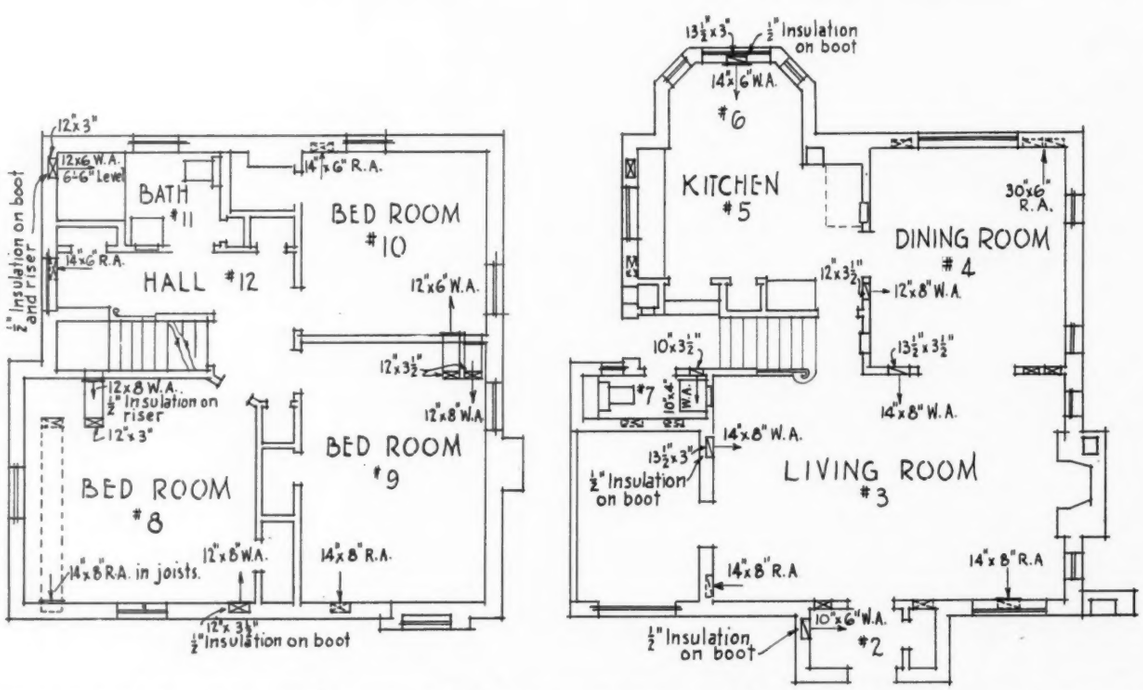
We have a 24-gauge galvanized duct, (that is the elbow), 5 feet long, so we carry that into poundage. Twenty-six and 7 would be 33, times 2 is 66-inch, or 5½ feet girth for the 26″ by 7″ duct. We have 5 feet of pipe times 5½ makes 27½ square feet. Twenty-seven square feet of 26″ by 7″ duct, 24-gauge, at 1.16 pounds per square foot is—twenty-seven times 1.16 equals 31 pounds net, of 24-gauge galvanized iron. We allow our waste at 15% or 5 pounds. Thirty-six pounds of 24-gauge is the total.

We continue run No. 1 the same way. First a 9″ by 7″ pipe. We have two sides, (2 times 7 is 14) (2 times 9 is 18) so 14 plus 18 times 252 (21 feet) divided by 144 equals 56 square feet for C1. The total square footage is 289 square feet. The ducts in this system in the basement calls for 26-gauge weighing .91 pounds per square foot. The net poundage is 263 pounds. Waste and allowance for seams is 30½ pounds. The gross poundage on the "C," "D," "E" and "F" group of ducts makes a total of 302 pounds gross.

Return Air Runs

Now for our basement return air ducts. We have our gathering chamber at the back of the fan. This is 30″ by 12″ by 30″ high (G1). Our fan housing will run about 4 to 4½ feet in the basement floor. We will take return No. 1. We have a trunkline of 28″ by 8″, 24-gauge. The chamber is 22-gauge. The first section is 4 feet

(*Continued on page 63*)



The two floor plans above and the basement pipe system on the first page of this article show plans used to illustrate Mr. Farris' discussion. The designed system is typical of the practices of the Cleveland installers guided by the Institute.

Air Temperature Rise In Cooling Air Ducts

By N. C. Ebaugh

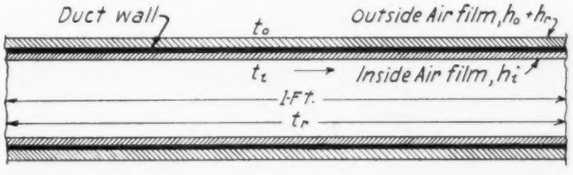
Head, Mechanical Engineering Department, University of Florida

A NUMBER of interesting problems arise when it is necessary to install cold air ducts in warm spaces. For illustration, it is necessary to know what the delivery air temperature will be at the end of such a duct, in order to determine the amount of cold air to introduce in the room to take care of a given load. Another question is, will it pay to insulate the duct and if so, what thickness should be used? Both questions depend on the amount of the air temperature rise as it flows through the duct.

Determination of Air Temperature Rise

The practical man usually searches for measured values in a case of this kind. But if measured values for the particular type of installation are not to be found, then the answer must be determined analytically. This article sets forth the analytical solution.

A section of duct 1 foot long is shown in Fig. 1. If the air entering at temperature, t_i, is cooler than the surrounding temperature, t_o, then heat will flow through the duct wall into the cool air stream.



Section of pipe showing air condition inside and outside which determine the magnitude of the temperature losses.

The amount of heat flowing through the duct wall is:

$$Q = UA\,(t_o - t_i) \text{ Btu per hr.}$$

where U = overall coefficient of heat transfer

A = area of duct surface

$t_o - t_i$ = temperature difference between the air outside and the air inside of duct.

The heat which enters through the duct wall is picked up by the air so that:

$$Q = MC_p t_r \text{ Btu/hr}$$

where M = lb. per hr. of air flowing

C_p = specific heat of air

t_r = temperature rise of inside air, F.

Since these two expressions are for the same amount of heat,

$$MC_p t_r = UA(t_o - t_i)$$

rearranging the terms gives

$$t_r = \frac{UA}{MC_p}(t_o - t_i) \qquad (1)$$

Equation (1) is perfectly general and may be applied to any shape duct and with any fluid but a more handy form is desirable for air ducts.

The things which are known about any duct are the size, length, and air velocity so that equation (1) will be changed to bring in these quantities.

It may be noted that

$$A = \frac{\pi\, d\, L}{12} \text{, sq. ft. for round ducts}$$

where d = duct diameter in inches

L = duct length in feet,

and $$M = 60\, Ve\pi(d/12)^2 \text{ lb. per hr.}$$

where e = air density in lb. per cu. ft.

$C_p = 0.24$

Using these facts in equation (1)

$$t_r = \frac{U\pi d\, L\,(t_o - t_i)}{\dfrac{60Ve\pi(d/12)^2\,0.24}{4}}$$

$$= \frac{3.33\, UL\,(t_o - t_i)}{Vde} \qquad (1a)$$

Equation (1a) may be used for any air density, length of duct and temperature difference, but for comfort air conditioning the density may be taken for 60° F. and nearly saturated air, or about 0.076 pounds per cubic foot. Doing this and expressing equation (1a) per

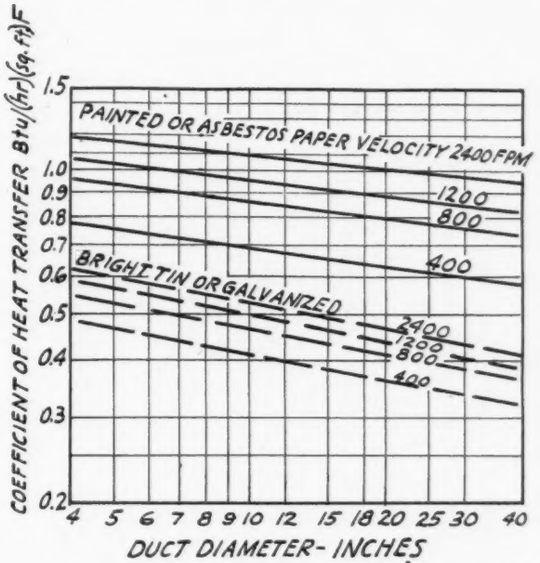


Fig. 2 Overall Coefficient of Heat Transfer For Cold Air Ducts

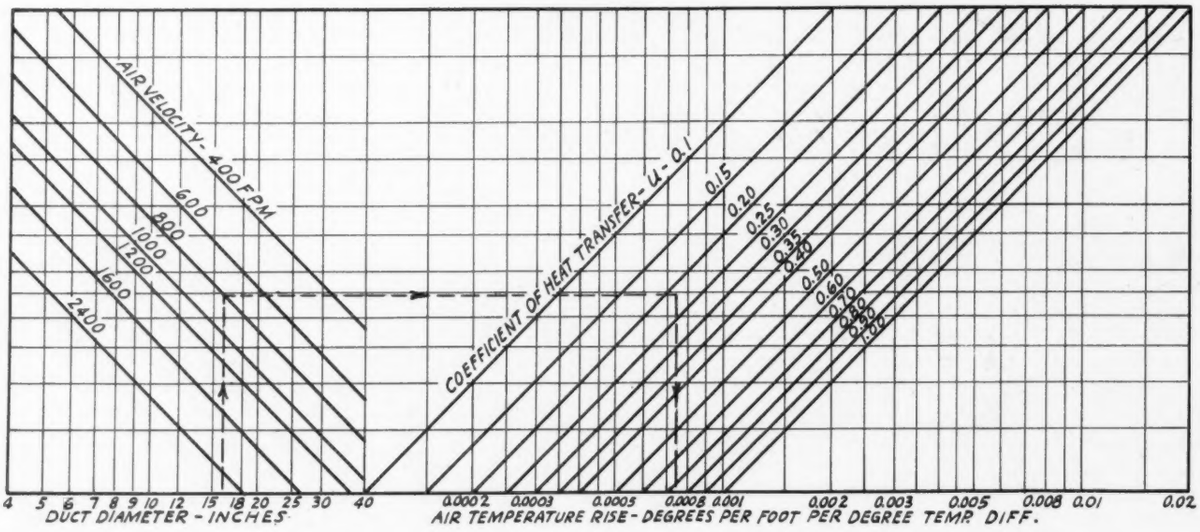


Fig. 4 Temperature Rise in Insulated Cold Air Ducts

foot of duct length and per degree F. temperature difference gives:

$$t_r = \frac{43.8\ U}{\sqrt{Vd}} \qquad (1b)$$

Equation (1b) gives the temperature rise in the air flowing through a round duct in degrees F. per foot of duct length per 1 degree F. difference in temperature between the outside air and the inside air.

Coefficient of Heat Transfer of Uninsulated Ducts

"The nigger in the woodpile" in equation (1b) is U, the overall coefficient of heat transfer. This depends on the duct size, air velocity and to some extent on the air temperature in the duct and surrounding it.

According to the usual method of calculating the overall coefficient:

$$U = \frac{1}{\frac{1}{h_i} + \frac{1}{h_o + h_r} + \frac{x}{k}} \text{ Btu./(hr.) (sq. ft.) (°F.)} \qquad (2)$$

where h_i = inside air film conductance due to forced convection

h_o = outside air film conductance due to natural convection

h_r = outside radiation effect

x = thickness of insulation, inches

k = conductivity of insulation, Btu. per hr. per sq. ft. per degree per inch of thickness.

W. H. McAdams in his book Heat Transmission, published by McGraw-Hill Book Co., gives for gases flowing in pipes

$$h_i = \frac{0.0269\ C_p G^{0.8}\ \mu^{0.2}}{D^{0.2}} \text{ Btu./(hr.) (sq. ft.) (°F.)}$$

where C_p = specific heat of air (0.24)

G = weight velocity, lb/(hr.) (sq. ft. of cross section)

$= 60\ Ve$

μ = absolute viscosity, lb/(hr.) (ft.)

D = diameter, ft.

This expression may be simplified for air, to

$$h_i = 0.0189 \frac{V^{0.8}}{d^{0.2}} \text{ Btu/(hr.) (sq. ft.) (° F.)} \qquad (3)$$

where V = air velocity, feet per minute

d = duct diameter, inches

Equation (3) is based on an air film temperature of 70° F., but temperatures 20 degrees one way or the other will have no appreciable effect on h_i.

W. J. King in his articles in March-August, 1932, Mechanical Engineering gives for natural convection on the outside of pipes

$$h = 0.23\left(\frac{\Theta}{D}\right)^{0.25} \qquad (4)$$

Where Θ = temperature difference between duct surface and outside air

D = duct diameter in feet

Taking Θ to be 10 degrees and using d in inches gives

$$h_o = \frac{0.76}{d^{0.25}}$$

Here again different values of Θ within reason will not materially effect the overall coefficient, U.

The radiation effect is given by:

$$h_r = \Sigma F_t \qquad (5)$$

where Σ = emissivity of surface

$$F_t = 0.174 \frac{\left[\left(\frac{T_1}{100}\right)^4 - \left(\frac{T_2}{100}\right)^4\right]}{T_1 - T_2}$$

T_1 = surface absolute temperature

$= t_1 + 460$

T_2 = surroundings absolute temperature

$= t_s + 460$

The emissivity of bright tin and galvanized iron ducts may be taken as 0.15, and 0.90 if the duct is painted, covered with asbestos paper, or insulated.

(*Continued on page 46*)

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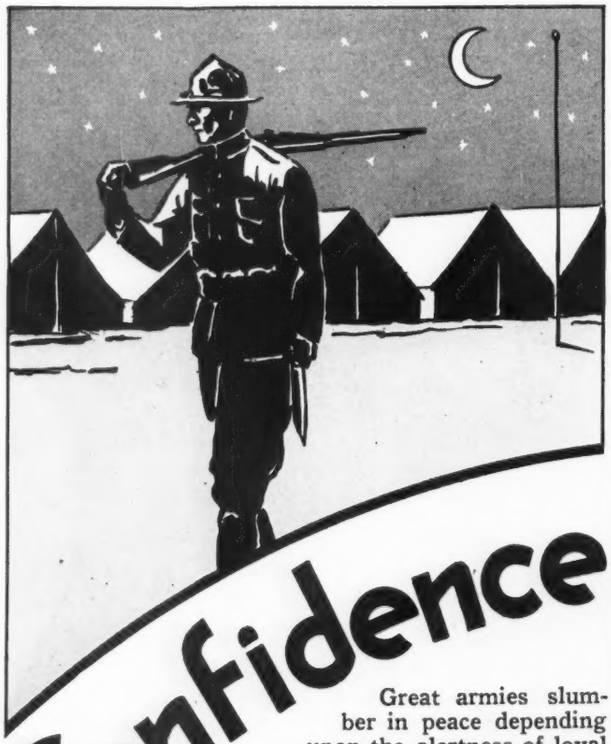

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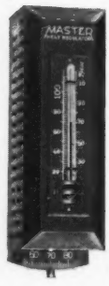

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MASTER HEAT REGULATOR

Temperature Rise In Ducts

(*Continued from page* 44)

The factor F_t will be close to unity in the range of temperatures to be expected in comfort air conditioning.

Using these values of h_1, h_o, and h_r

$$\text{gives } U = \frac{1}{\frac{1}{0.0189\frac{V^{0.8}}{d^{0.2}}} + \frac{1}{\frac{0.76}{d^{0.25}} + 0.15}} \qquad (6)$$

for bright tin or galvanized ducts, uninsulated.

Table 1 and Fig. 2 give values of U for this case.

Also

$$U = \frac{1}{\frac{1}{\frac{0.0189\,V^{.08}}{d^{0.8}}} + \frac{1}{\frac{0.76}{d^{0.25}} + 0.9}} \qquad (7)$$

for painted ducts or covered with 1 layer of asbestos paper.

Table 1 and Fig. 2 also gives values of U for this case.

Coefficient of Heat Transfer for Insulated Ducts

Values of U_i for insulated ducts can be secured with the aid of equation (2). This may be arranged to read:

$$U_i = \frac{1}{\frac{1}{U_u} + \frac{X}{k}} \qquad (2a)$$

where U_u = coefficient for uninsulated and painted ducts.

This is given on Fig. 2. (Page —)

Another arrangement of equation (2a) which is easier to work with is

$$U_i = \frac{U_u k}{k + XU_u} \qquad (2b)$$

An illustration of the use of equation (2b) is of interest. Suppose it is desired to determine the value of the coefficient of heat transfer for a 20-inch duct carrying air at 1200 feet per minute velocity and insulated with 1 inch of material having a conductivity of 0.3. The value of U_u for the uninsulated duct is read from Fig. 2 as 0.90. The value from the upper set of curves should be used because the emissivity of the insulated duct will correspond to that of a painted one. Substituting the proper values in equation (2b) gives:

$$U_i = \frac{(0.9)\,(0.3)}{0.3 + (1)\,(0.9)} = 0.225 \text{ Btu./(hr.) (sq. ft.) (° F.)}$$

for the insulated duct.

Temperature Rise

The air temperature rise is secured with the aid of equation (1b).

Figure 3 gives the unit temperature rise for bright tin or galvanized ducts and for painted ducts or those covered with one layer of asbestos paper. (Next page)

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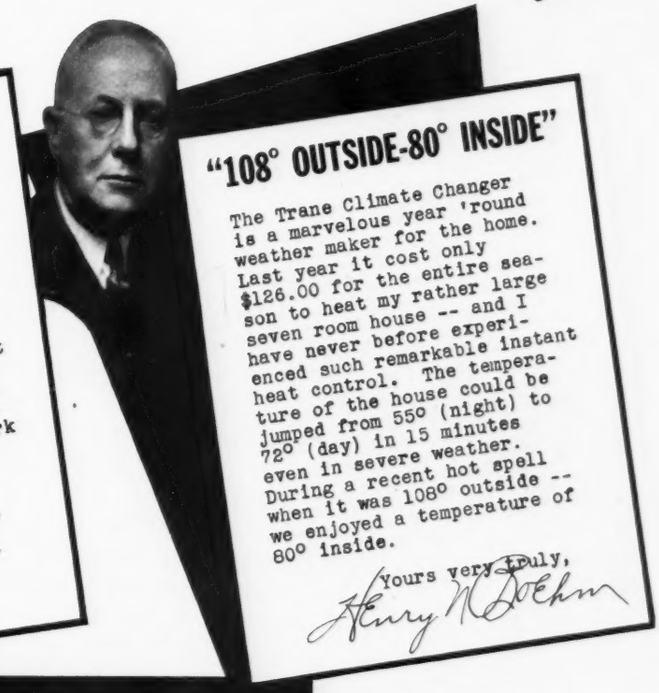
"A SNAP TO INSTALL"

It was genuine pleasure to work with the Trane Climate Changer. It was so light and easy to handle that we were able to save an almost unbelievable amount of time in making the installation. It was such a snap to install that it actually meant to us a substantial and unanticipated increase in our profits. Naturally we welcome the opportunity to work with and recommend Trane Products in the future.

Yours very truly,

Al. J. Svec

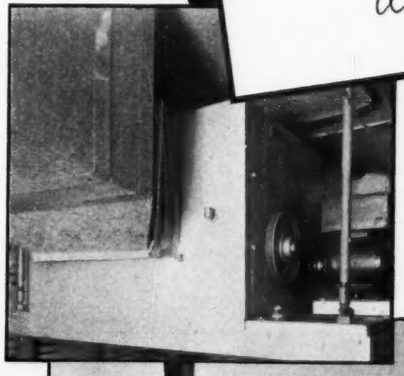


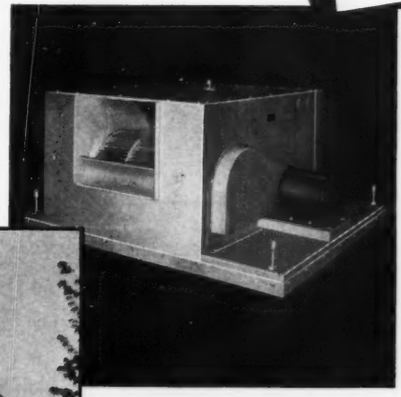
"108° OUTSIDE-80° INSIDE"

The Trane Climate Changer is a marvelous year 'round weather maker for the home. Last year it cost only $126.00 for the entire season to heat my rather large seven room house -- and I have never before experienced such remarkable instant heat control. The temperature of the house could be jumped from 55° (night) to 72° (day) in 15 minutes even in severe weather. During a recent hot spell when it was 108° outside -- we enjoyed a temperature of 80° inside.

Yours very truly,

Henry N. Boehm





The attractive and modern La Crosse home of Henry N. Boehm and two views of the Trane Climate Changer that keeps inside temperature uniformly comfortable twelve months out of the year.

Quick Facts about the installation

Size of House: 7 rooms (large)

Type of Heat: Hot water

Fuel Used: Oil

Cooling Medium: 54° city water

Trane Unit Installed: No. 3 Climate Changer with 6 rows of Trane extended surface Heating and Cooling Coils—all 6 rows used in both winter and summer.

Date of Installation: October, 1935

The enthusiasm expressed by both the Contractor and the owner of the house after this job was completed is typical of the satisfaction felt by the thousands who have had experience with Trane "Exclusive Feature" equipment. Every element that goes into Trane Heating, Cooling or Air Conditioning equipment is built for easier, more economical installation, greater efficiency and economy in operation.

If you are faced with any kind of inside weather making problem, small or large, typical or unusual, requiring a special installation it will save you time and money if you "Ask Trane First."

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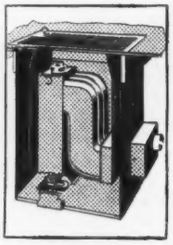

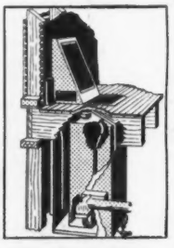

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Figure 4 is drawn up for insulated ducts and gives the unit temperature rise as soon as the overall coefficient of heat transfer is calculated with equation (2b). The illustration shown is for a 16-inch duct insulated with 1 in. of material of conductivity 0.3 which is carrying air at 800 feet per minute velocity. For this case U is 0.22 and t_r is 0.00074 degrees per foot per degree temperature difference. The temperature rise in 100 feet of such a duct carrying air at 60 F. and passing through a space at 100 F. would be $0.00074 \times 100 \times (100 - 60)$ or 2.96 degrees. (See page 44.)

Proper Thickness of Insulation to Use

Figure 5 is drawn up to show the effect of insulating a 16-inch duct with a good grade of insulation. Two things are immediately apparent. First, to paint or cover this duct with 1 layer of asbestos paper just about doubles the refrigeration loss. A second fact shown is that it takes between ¼ and ½ inch of insulation to bring the coefficient back to that of a bright duct. In other words, to install less than ½ inch in this case is a waste of money. (Next page)

Figure 6 shows the temperature rise for 60-degree air flowing through a 16-inch duct at 800 feet per minute, for bare and insulated cases.

It is an easy matter to draw up curves similar to

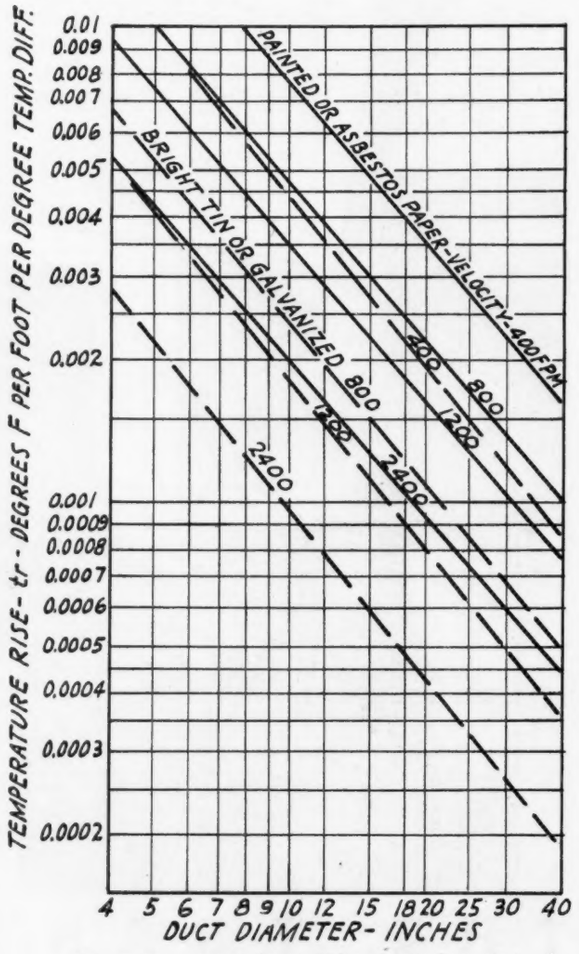
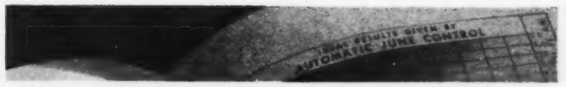


Fig. 3 Temperature Rise in Uninsulated Cold Air Ducts Degrees per foot per Degree Temp. Diff.



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. . . YOU CAN SELL RE-HUMIDIFICATION ON A SCIENTIFIC BASIS

FOR THE FIRST TIME the home owner can have correct relative humidity without the annoyance of frosted or weeping windows.

FOR THE FIRST TIME ample indoor humidity can be provided in mild weather when furnace bonnet temperatures are low.

FOR THE FIRST TIME an evaporator has been designed with plus evaporating capacity . . . yet with horizontal area so small that it does not impede air flow inside the heating chamber.

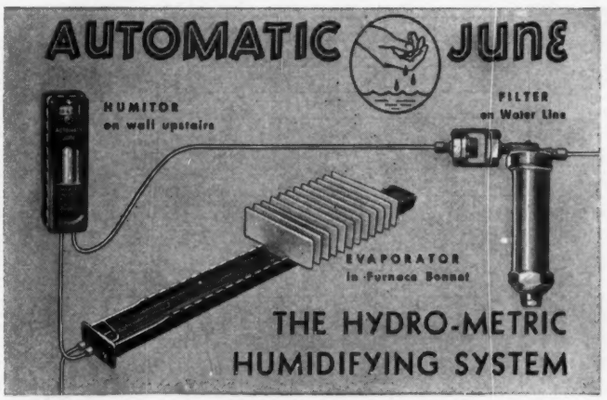
FOR THE FIRST TIME indoor re-humidification is put on a scientific basis . . . because of this new and revolutionary humidifying system—Automatic June.

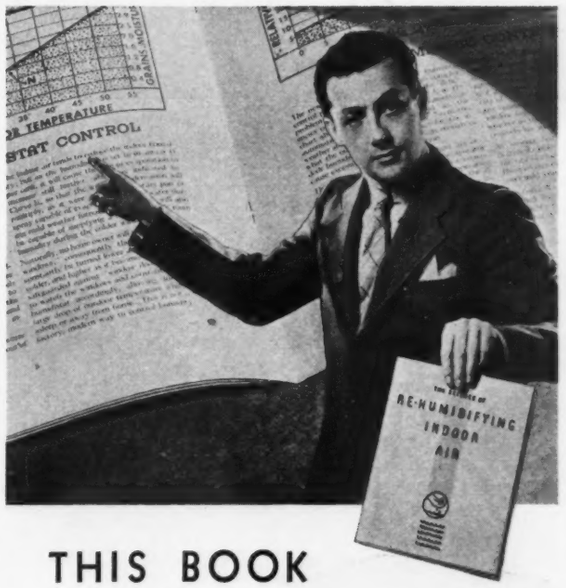
Automatic June is based on the newly discovered Hydro-Metric humidity control principle. Now, for the first time, indoor humidity is regulated by and correlated with outside temperatures.

Automatic June is a humidifying system, not a humidifier. It has no more relation to ordinary types of humidifiers than the pot-bellied stove has to the modern air conditioning system.

Send for particulars.

THE MONMOUTH PRODUCTS CO.
231 E. 131st St., Cleveland, Ohio





THIS BOOK SHOWS YOU HOW

Written in simple understandable language, this book will give you, in not more than two hours time, a clear picture of the process of re-humidifying indoor air scientifically. Charts in color visualize the story so that you can quickly explain this new principle to others.

Send for this new book, "The Science of Re-Humidifying Indoor Air," together with literature describing Automatic June, the Hydro-Metric Humidifying System, and particulars of the Automatic June proposition.

Manufacturers—Jobbers—Dealers

Automatic June opens a new era in automatic re-humidification of indoor air. It makes it possible to attain results never before attempted , . . to realize aims that hitherto have been only vaguely understood. Home owners are waiting for this entirely automatic system. Automatic June presents new and greater sales possibilities. It yields considerably the largest dollar profit of any humidifying equipment. Investigate the possibilities today.

THE MONMOUTH PRODUCTS CO.
231 E. 131st St., Cleveland, Ohio

Please send me descriptive literature on Automatic June and book, "The Science of Re-Humidifying Indoor Air."

Name .....

Business .....

Address .....

City ..... State .....

Announcing-
A NEW HY-DUTY BLOWER-FILTER UNIT

...The **BEST BUY**
IN THE COMPETITIVE FIELD
...DESIGNED PRIMARILY TO OFFER
THE MOST POSSIBLE IN

- PERFORMANCE
- RELIABILITY
- SELLING FEATURES

at a **LOW PRICE**

FLANGED OPENING FOR INLET PROVIDED
FOUR FILTERS OF A NATIONALLY KNOWN MAKE ... COMPLETE ACCESSIBILITY
SPLIT CONSTRUCTION ... SAVING ON INSTALLATION in TIGHT PLACES

Hy-Duty Quality Throughout

14" Hy-Duty Blower, Forward Curved Multi-Vane Type

Capacity Far in Excess of Requirements ... Slow Speed ... Quiet Operation

Blower Bearings ... Self Aligning, Self Oiling, Rubber Mounted

Heavy Gauge Rust Resisting Steel Throughout

Motor Integrally Mounted ... Rubber Cushioned ... Variable Speed Pulley ... V-Belt

Attractive Lines ... Attractively Finished

Ready for delivery ... Write quick for prices and engineering information

SCHWITZER-CUMMINS CO.
BLOWER DIVISION
FAN STREET.... INDIANAPOLIS, U.S.A.

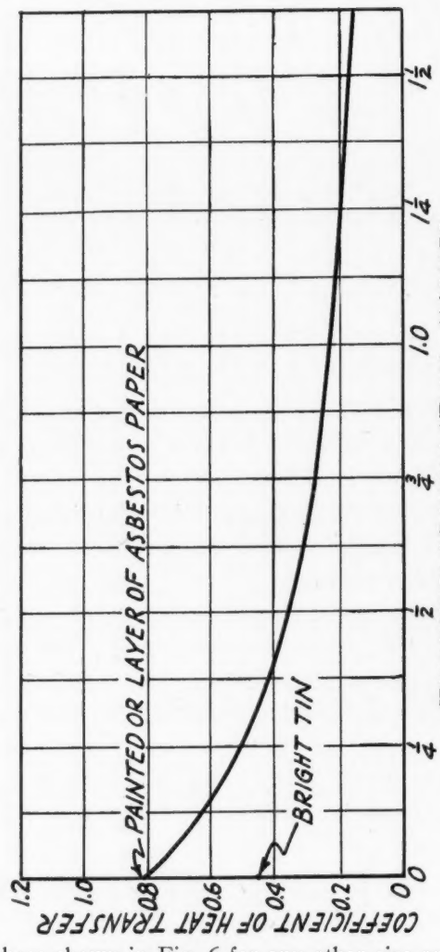


Fig. 5 Coefficient of Heat Transfer for Various Thicknesses of Insulation of 0.38 Btu/(hr)(sq.ft.)(F)(in.) Conductivity Applied to a 16 in. Duct-Air Velocity 800 FPM.

those shown in Fig. 6 for any other size and condition by using Figs. 2, 3 and 4 to obtain the unit temperature rise and then multiply this value by the length and temperature difference. The temperature rise is then added to the entering air temperature to obtain the delivery temperature.

The proper thickness of insulation to use is a problem such that the cost of applying the insulation is saved in a reasonable time through reduced refrigeration capacity and lower operating cost.

In many cases, the heat gain through the duct walls helps to cool the building and no deduction of refrigera-

(*Continued on page 70*)

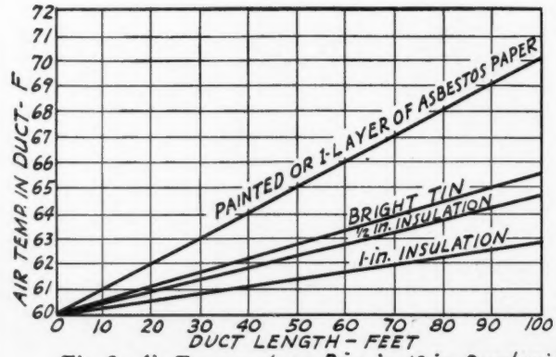


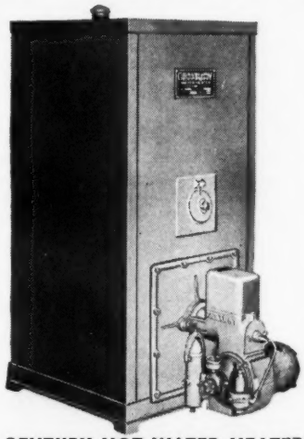
Fig. 6 Air Temperature Rise in 16 in. Duct with Various Insulations - Velocity 800 FPM. 60 F Air Entering - 100 F Air Surrounding.

NEW STREAM LINED CENTURY

NEW FEATURES

New and Improved FLOATING FLAME plus EVEN-FLO Combustion gives maximum heating efficiency. Fuel savings up to 35% under actual field tests.

MODEL J BEATS ALL RECORDS



CENTURY HOT WATER HEATER

This extra big capacity hot water heater is taking the country by storm. Easy to sell. Economical to operate. Provides 200 gallons hot water an hour from less than a gallon and a half cheap oil. No storage tank needed. Ideal for large requirements with storage tanks with same rate of pick-up. Get details, prices, liberal discounts.

A WINNER right from the start! That's this new stream-lined Century Model J. It's broken all sales records for new models.

Dealers everywhere acclaim its amazing simplicity . . . its easy accessibility for service and adjustments. Imagine! Simply by removing the blower cover plate directly over the fan wheel, the entire electrode assembly is open to view . . . the nozzle, ignition points, ignition cable, transformer terminals, fan wheel, and universal couplings.

The service man can watch all moving parts in actual operation as he checks each feature or makes adjustments. It's easy, quick, and simple. Cuts service time and expense to a new record low.

Of course prospects take to Century Model J for its attractive design, the economy of Floating Flame and Even-Flo Combustion, and the many other sensational new features. You're passing up a winner if you don't stake your conversion burner sales on Century Model J. Write or wire today for details. The money-making Century franchise perhaps may still be open in your territory.

COMPLETE CENTURY UNITS

Century complete units, including the new Century Warm Air Furnace with Winter Air Conditioning, and the Century Boiler-Burner Unit, have boosted dealers' profits to highest levels in years. Sell the complete Century line and you won't miss a sale. Write for full information at once.

CENTURY ENGINEERING CORP.

Cedar Rapids, Iowa

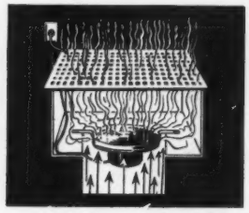
OIL BURNERS
WATER HEATERS
BOILER-BURNERS
HUMIDIFIERS
WARM AIR FURNACE UNITS
AIR CONDITIONING

Sensational Offer to Introduce

VICTOR HEAT BOOSTERS

Solves the Cold Room Problem—*Cuts Fuel Costs*

Every furnace heated home in your community with one or more "cold" registers is a real profit opportunity for you. No matter what the cause—a Victor Heat Booster will pull the cold air cork from the run and permit the heat to flood the room with genial warmth. Costs only two or three cents a week for operation and pays for itself many times over in fuel savings.

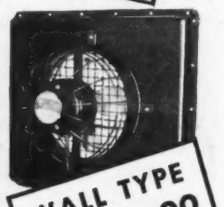


Works Like MAGIC— ***Results Guaranteed***

Home owners are amazed when they find how easily and inexpensively their cold room problem can be solved. No selling is necessary—just a 5-minute demonstration and they "buy" it. You can guarantee results and we stand back of you because a Victor Heat Booster never fails.

One $7.50 Booster FREE with an Order for Three

To prove to you that you can reap a harvest of quick, easy profits on Victor Heat Boosters, we are making the extraordinary offer of one $7.50 Booster absolutely FREE with an order for three—which gives you a margin of over 50% on the deal. And, in addition, we give you without charge a big 4-color window display and powerful 2-color handbills to bring you inquiries for demonstrations. Investigate now. Get set to cash in on Victor's Extra Profit Plan. Clip coupon and mail for full information.



MAIL TODAY—GET $7.50 Extra Profit

VICTOR ELECTRIC PRODUCTS, INC.
726 Reading Road, Cincinnati, Ohio.

Send immediately information on Victor Heat Boosters and details of your $7.50 "Extra Profit" Offer.

Name .....

Address .....

Town ..... State.....

$7,500 House Conditioning

(*Continued from page* 33)

"In the summer cooling cycle, the blower runs continuously. Air is supplied to the blower in cooling through a combination of inside and outside air intake. The cooling thermostat on the first floor operates the compressor only. The idea is that in this part of the country, use of the compressor is not necessary during a large portion of the summer, and the house can be cooled during the major part of any 24-hour period by using mixed outside air and inside air circulation. When the inside temperature exceeds a pre-selected temperature, the compressor starts. The setting at which the compressor cuts in can be adjusted by the owner. The control system is so wired that a double pole switch

To advertise the development Mr. Bishoff erected this 42-foot billboard prominently featuring the air conditioning system.

cuts out the cooling and throws in the heating, or vice versa. A spray type humidifier with humidity control is installed in the furnace.

"During the past winter (1935-1936) with an approximately 15 per cent colder winter, a total of 800 gallons of fuel oil were used at a cost of six and a half cents per gallon. The total heating cost for eight months averaged $6.50 per month. This is in the house occupied by Mr. Bishoff.

"The total cost of the heating and cooling equipment in the first house, now occupied by Mr. Bishoff, was $1,650, of which the $745, referred to previously, covers the apparatus for the cooling system."

"The house with the gas furnace was not used last heating season, consequently the cost of operation between the two fuels could not be compared to see which installation was the most efficient.

"During the heating season we checked the temperature differential between the floor and ceiling to see what is the effect of entrance of warm air 7' from floor. We found the differential to be below the average when compared to the installation of base registers. This can no doubt be accounted for since we were delivering approximately 1000 C.F.M. which made between 11 to 12 air changes per hour, in the house.

"With the blower control operating at 135 deg. the register temperature averaged between 110 to 120 deg. depending on the length of the duct. This register temperature would be rather low for baseboard, but with the air entering as it does at the ceiling such a register temperature must have been satisfactory as no complaint was received from the owner.

Otto Jaehnert, superintendent Mueller's sheet metal shop, shows Harold Mueller the nameplate for the new Series Twenty Air-Conditioning Oil Furnace.

FATHER WOULD HAVE APPROVED

THE other day we finished tests on the new Mueller Air-Conditioning Oil Furnace. The Series Twenty we call it, and it is a beauty.

When Ed. Jones, our Chief Engineer, and Otto Jaehnert, superintendent of the sheet metal plant, showed me the results, I couldn't help but imagine how elated my dad and grandfather would have been at the achievement.

They dedicated their lives to improving the heating systems of American homes and they left that heritage to *me*. Things have changed a lot in the heating business in the last decade, but I have tried to carry on with the standard of leadership which they set.

This new Series Twenty Air-Conditioning Oil Furnace is our contribution to the 1936 home heating need. It gives automatic heat, filtered, humidified and circulated air to homes. It is beautifully styled, moderately priced and, I believe, opens a vast new field.

Let me send you our folder describing this new furnace. And don't forget that Mueller still makes the most complete line of heating equipment in the industry, including gas, oil and coal-fired furnaces and boilers, and Climator Air-Conditioning equipment.

The New Mueller Series 20 Air-Conditioning Oil Furnace

Here is the answer to the demand for an oil-fired, air-conditioning furnace at a moderate price. It accommodates practically any gun type burner, and is furnished with or without burner.

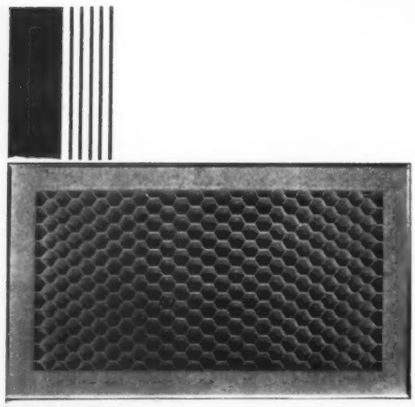
The Series 20 consists of furnace, fan, filters and air moistener. For full details see "Series 20" Folder.

New Time Payment Plan

Write for full details about the new FHA Time Payment Plan handled through First Bancredit Corporation. Also learn about special summer selling plan. Dealer gets cash for his heating job, yet customer makes no down payment and first payments do not begin till October 1st.

H. P. Mueller
PRESIDENT

MUELLER-MILWAUKEE



No. 90 Design

IT'S THE DEPTH THAT DOES IT!

H & C DIRECTIONAL GRILLES

provide:

DUAL CONTROL OF AIR FLOW
(Horizontally as well as sidewise)

GREATER UNIFORMITY OF ROOM TEMPERATURE

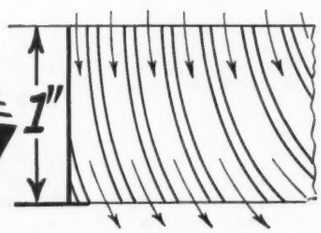
ELIMINATION OF TURBULENCE

MINIMUM RESISTANCE AND NOISE

COMPLETE CONCEALMENT OF DUCT

These features, positively essential to maximum air conditioning results, are made possible solely through the unusual depth of H&C Directional Grilles. No other grille is of equal depth. Consequently no other grille will give you equal results.

Write at once, for your free copy of our No. 35 A C catalog. You'll find it decidely helpful. See the H & C No. 90 Series of Grilles and Registers at your H & C Jobbers' without delay.



HART & COOLEY MANUFACTURING CO.
Warm Air Registers Regulator Sets H&C Air Conditioning Grilles Dampers · Chain
61 W. KINZIE ST. · CHICAGO · ILLINOIS
In Canada: Fort Erie N., Ontario

Voorhees Converting Gravity

(*Continued from page* 35)

of such ducts larger than we would provide if we were using round metal pipes.

HOW MUCH greater area needs to be provided so as to reduce the air velocity sufficiently to compensate for rectangular shape and rough surface?

Effective Area

Experience has shown that for panned joists, we are usually safe if we assume that the *effective* area of the space is taken as the area of the inscribed ellipse. This same rule applies very well to studding spaces when galvanized iron is nailed to the studding before the lath and plaster are applied. For studding spaces which are not so protected and where air must rub against rough lath and plaster on the two long sides of the duct, it is often assumed that the effective area is from 50% to 60% of the "nominal" area which is taken as about 3½"x14". Thus, while the nominal area of the space is 49 square inches, the effective area is about 25 or 30 square inches.

For joist space or wherever the "ellipse method" is used, the effective area is 0.7854 times the actual area.

Suppose for example, that one pair of nominal 2"x10" joists are panned to form an air duct. The true dimensions of nominal 2x10 joists are 1⅝"x9½",

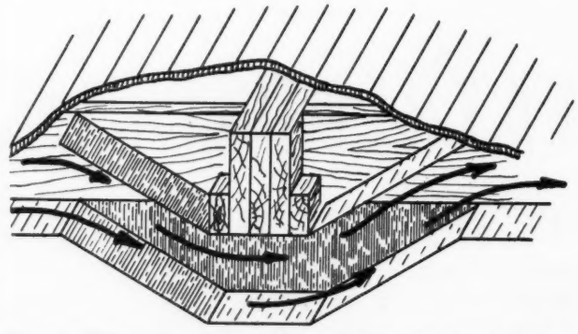


Fig. 6—When you pass under a beam you create a trap, but the fan will pull the air through if you provide a suitable fitting like this.

and if they are set 16 inches on centers, the actual dimensions of the duct so formed are 9½"x14⅜", and the total cross sectional area is 136.46 square inches.

The area of the inscribed ellipse (see Fig. 1) is 0.7854 times this total area, or 107 square inches.

Fig. 1 gives the effective area of one or more of the spaces formed by panning the common dimensions of joists, with the galvanized iron nailed directly to the bottom of the joists.

When the pan is extended downward from the bottoms of the joists, the effective areas are given in Fig. 2.

If the return duct formed by panning joists passes over a wall or girder which carries the joists, the (usually) restricted space (Figs. 3 and 4) is "the neck of the bottle" and the effective area between any adjacent pair of joists will be 0.7854 times W-X-H.

When air is carried between the joists above the

behind THESE PRODUCTS

a reputation built on Quality

Quality means so much to every dealer. It is upon quality that a dealer stakes his reputation and his success.

A product that can be sold and stay sold is the first requirement to successful dealership.

The Nu-Way "Genii" line of automatic heat has been built FIRST to a standard of quality.

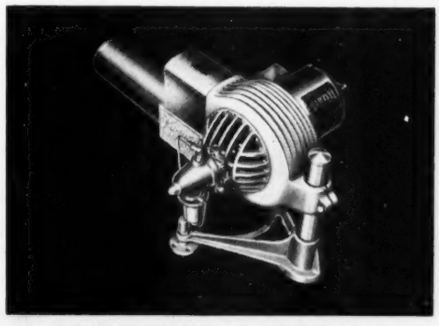
It will pay any aggressive dealer who is interested in having a line of automatic oil heating units that can meet the requirements of every type of home in his territory—to write TODAY and see if the NU-WAY FRANCHISE IS AVAILABLE IN HIS COMMUNITY.

THE NU-WAY CORP.
Rock Island Illinois

nu-way "Genii"

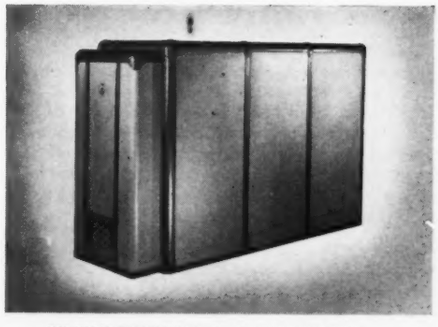
OIL BURNERS
OIL HEATING BOILERS
WINTER CONDITIONERS
HOT WATER GENERATORS

OBI MEMBER OIL BURNER INSTITUTE



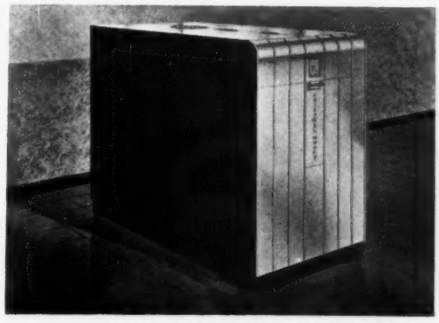
NU-WAY "GENII" OIL BURNERS

Nu-Way "Genii" Automatic Oil Burners are built in three sizes and four models.



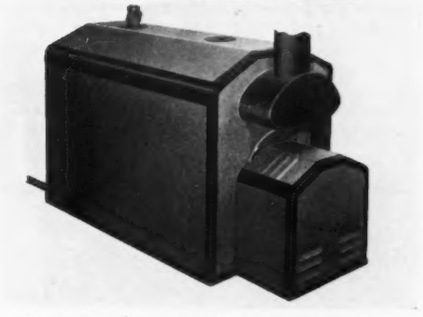
NU-WAY EVANS WINTER CONDITIONER

Nu-Way Evans "Genii" Winter Conditioner has larger radiating surfaces, with burner, fan, filters and humidifier all enclosed.



NATIONAL NU-WAY OIL HEATING UNIT

National Nu-Way Oil Heating Units are built for hot water or steam systems.



NU-WAY "GENII" HOT WATER GENERATOR

Nu-Way "Genii" Hot Water Generators are built in two sizes—Model W for homes. Model WL for apartments and large buildings.

NEW AEROFIN
Crown Orifice
Stops Scale Clogging

Assures Constant Steam Flow—Prevents Freezing

Aerofin announces another important contribution to heating tube design. Its new "crown orifice," now standard on all Aerofin equipment, banishes trouble caused by scale clogging. The sharp protecting points of the new orifice (see illustration) breaks up scale and prevents closing of the orifice, while at the same time allowing free passage of steam to the tubes. All danger of freezing due to stoppage of steam flow or insufficient distribution, is eliminated.

Serious interruptions to plant operations have been traced to scale clogging and consequent freezing of tubes. The new "crown orifice," combined with Aerofin's standard bronze headers, completely eliminates this trouble.

Here's another reason for specifying Aerofin, another indication of Aerofin's alertness to the practical problems of the architect, engineer and heating contractor. That's why Aerofin is the inevitable choice of experienced professional technicians. Aerofin never disappoints them, whether the job is large or small—for heating or cooling or for both, there is an Aerofin unit exactly fitted to your need.

AEROFIN is sold only by Manufacturers of Nationally Advertised Fan System Apparatus. List upon Request

AEROFIN CORPORATION
850 Frelinghuysen Avenue
Newark, NJ
Chicago Detroit New York Philadelphia

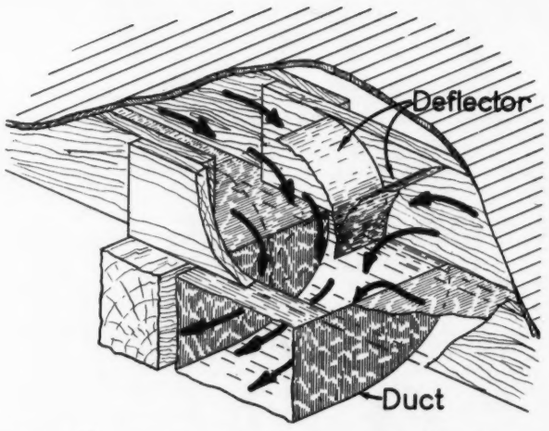


Fig. 7—Where two joist pans come together into one lower right angled trunk, place deflectors like this to steer the air into the trunk and eliminate turbulence.

wall or girder, the bottom of the pan should be angled up to the top of the girder as shown in Fig. 5.

If the space available above the girder is too small to be worth using, or if the joists butt into the sides of the girder, the pan may be angled down underneath and back up again as shown in Fig. 6. In gravity heating this would be considered bad practice because of some tendency to "trap" the air at this point, but with blower suction to compel circulation, return air will readily "flow up hill."

When one joist space is used to carry air from two opposite sides of the house and deliver it to a central metal return trunk line running transversely of and below the joists, galvanized iron deflecting plates should be installed as shown in Fig. 7 to prevent the two air current "fighting" each other and setting up unnecessary turbulence and friction loss.

The general rule that each branch leading to a return air trunk line should be equipped with a lock type damper, applies to panned joist spaces just as it does to metal ducts, although it is noticeable that some installers neglect this. The excuse usually given is that it's "difficult" or "too expensive" but if the galvanized iron bottom of the duct is stiffened at the point where the damper is to be installed, it can be set somewhat as shown in Fig. 8 without difficulty. As to expense, it's very much more expensive to properly regulate return air flow on just one "trouble job" than to install such dampers on a dozen jobs.

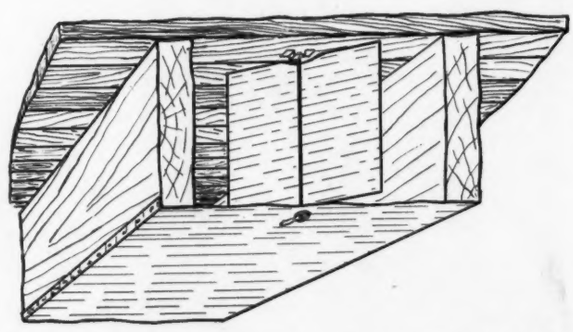


Fig. 8—All returns should be dampered. Here is a construction for a panned joist run.

Geiger on Noise Problems

(*Continued from page 37*)

the different size grilles. Of course, if the grille area is increased and the volume flow of air is kept constant, the velocity will be lessened and the noise also. For example consider a grille like B, Fig. 3. For a grille of one half square foot area and a velocity of 2000 feet per minute, the loudness level (by Fig. 3) is 42.5 decibels. If the area of the grille were increased to one square foot and the volume flow kept the same, the velocity would be reduced to 1000 feet per minute. The loudness level of a half square foot grille at 1000 feet per minute is, from Fig. 3, 19 decibels. Applying the correction for area as given by Fig. 4, it will be seen that the one square foot grille at this velocity will have a loudness level of 22 decibels.

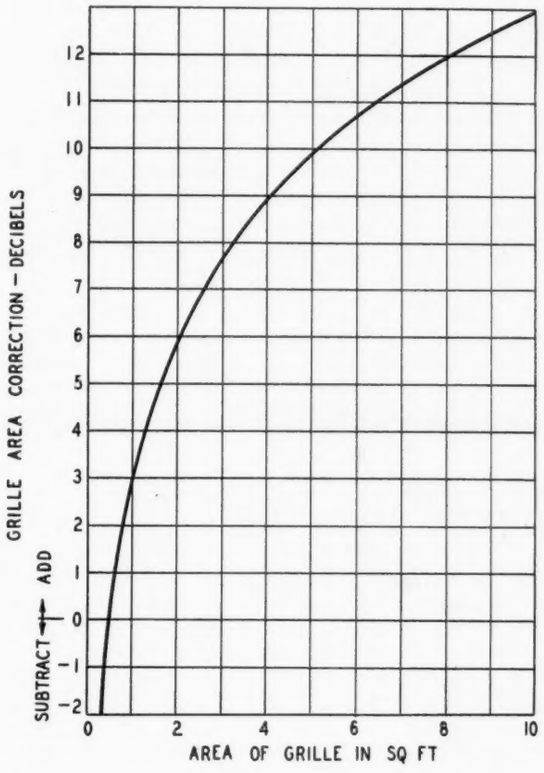


Fig. 4.—Curve to Correct Figure 3 for Grilles of Different Areas.

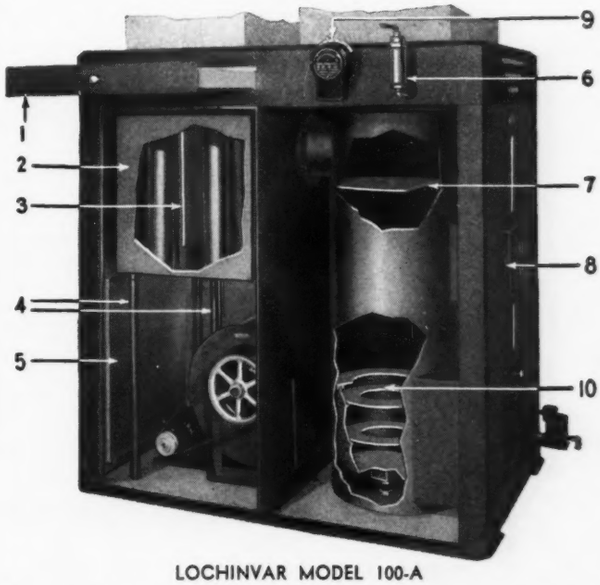
The figures above show that the noise level decreases rather rapidly as the size of a grille is increased, provided that the total amount of air flowing remains the same. The same fact is shown in Figure 4A, where the loudness level of grille noise is shown for different size grilles. The volume air flow, in cubic feet per minute, for each of the curves is shown. The figures apply to a Type B grille, but they may be considered as typical of most grilles. (See next page for Fig. 4A.)

In case more than one inlet grille is used in a room, the noise may be computed as if only one grille were to be used, with an area equal to the sum of the areas of the separate grilles. Since the velocities used for the return air intake grilles are usually lower than the input grilles, their noise need not be considered.

THE NEW MODEL 100-A

LOCHINVAR FURNACE

Complete Winter Air Conditioning
For The Volume Market



LOCHINVAR MODEL 100-A

1. Drawer containing filters
2. Double radiator with 6 flues
3. Baffle
4. Support legs
5. Fan and motor access door
6. Humidifier with safety feeder—built entirely of brass with copper-bronze pan
7. Deflector baffle
8. Water coil opening
9. Bonnet switch
10. Lochinvar Multiple Stage Burner.

Filtered, humidified air—exact, automatic temperature regulation—all the features of a high quality—long lasting—modern heating plant—fully comparable to systems of much higher price.

That is what the new Lochinvar Model 100-A Furnace offers for the volume market.

Note the features shown in the illustration above.

In addition, there is the Lochinvar Oil Burner—

This Burner uses No. 1 Fuel Oil—efficiently, without moving parts—no pumps, blowers, whirlers and no electric ignition. "Whisper" silent, practically 100% clean at highest capacity, full automatic control.

Write for details on this New 100-A Lochinvar Furnace—it is another Lochinvar profit maker.

Lochinvar makes Furnaces, Models 100 and 100-A, Water Heaters, Room Heaters, of highest quality—equipped with the Lochinvar Burner.

Lochinvar Corp.
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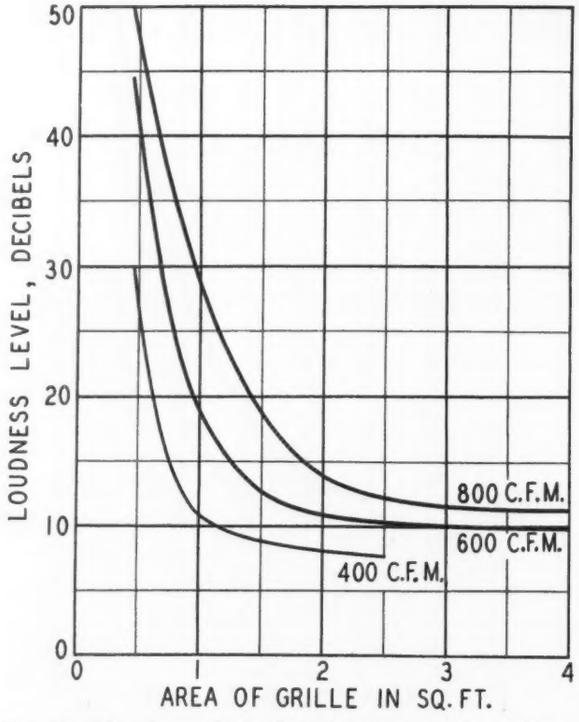

Fig. 4A—The change in loudness level for a given volume air flow through different sized grilles.

Influence of Surroundings on Noise

Since sound is absorbed in varying amounts by different surfaces, the noise made by air flowing through a grille will be different in different rooms. If the room has hard plaster walls and ceiling, tile floors and no rugs, draperies, or upholstered furniture, the noise will be much greater than it will in a room having thick rugs, heavily upholstered furniture, and heavy draperies for in the latter case the sound is absorbed by the porous surfaces. The following paragraphs tell how to determine how much the noise of a grille, as given by Figure 3, is changed in different rooms.

The data used in plotting the curves of Figure 3 apply to the average living room. Since the correction to be applied is not very large for ordinary rooms it will not be necessary to correct the values given in Figure 3 unless quite accurate estimates are required. However, for special cases, such as broadcasting studios, it may be desirable to make the corrections.

In order to correct for the sound absorbing qualities of a room and its contents, it is necessary to know how many sound absorbing units there are in the room. The number of sound absorption units in any surface is equal to the area in square feet of that surface multiplied by the sound absorption coefficient for that surface. The sound absorption coefficients of some common materials are given in Table II. The coefficients of other materials may be found in handbooks. An especially complete list is included in Knudsen's "Architectural Acoustics" (John Wiley and Sons, Publishers). The total number of sound absorption units in the room is the sum of all the units obtained for each surface. If a floor is covered partially by a rug, the portion of the floor under the rug is not included in the calculation. The computa-

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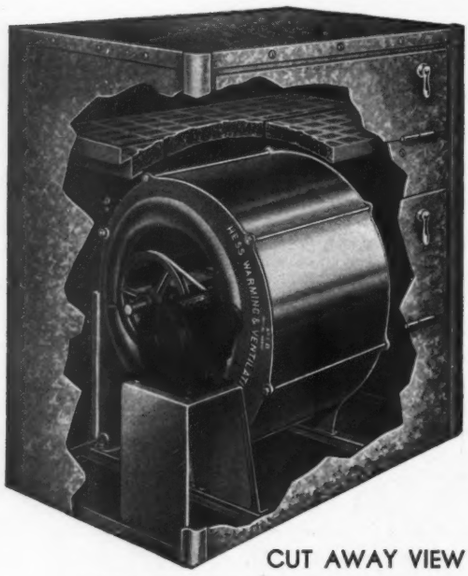

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tions do not need to be made with any great accuracy, rough approximations will be sufficient.

TABLE I
Sound Absorption Coefficients

Material	Sound Absorption Coefficient
Carpet	.20
Rugs	.30
Linoleum	.03
Wood, flooring or paneling; ordinary plaster	.03
Brick wall	.02
Draperies, light weight	.10
Draperies, heavy	.40
Glass	.02

	Sound Absorption Units
Person, each	4
Chair, large, heavily upholstered	6
Upholstered davenport, each	10
Plain wood chair, each	.2

When the number of absorption units are computed, the value to be added or subtracted to the noise value as given by Figure 3, is obtained from Figure 5.[1]

Tests on grilles equipped with valves show that a single shutter valve is quieter than a multi-shutter valve. Contrary to the opinions held by some, the location of

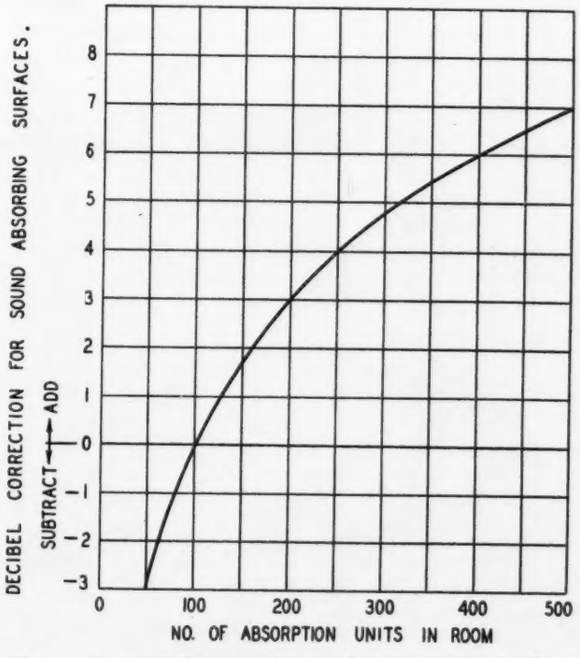

Fig. 5.—Curve to Correct Figure 3 for changes in Loudness due to the acoustic characteristics of different rooms.

the grille in a room is not of much importance from the viewpoint of the noise it makes. When the flow of air through a grille is not uniform, the noise is somewhat greater than the value given by Figure 3.

In the next article a discussion will be given for reducing the noise made by air conditioning equipment other than grilles.

[1]Figure 4 is computed from the relation
$$\text{Decibels Correction} = 10 \log_{10} (a/100)$$
where "a" is the number of absorption units in the room. The values of Figure 3 apply to a room with 100 absorption units.

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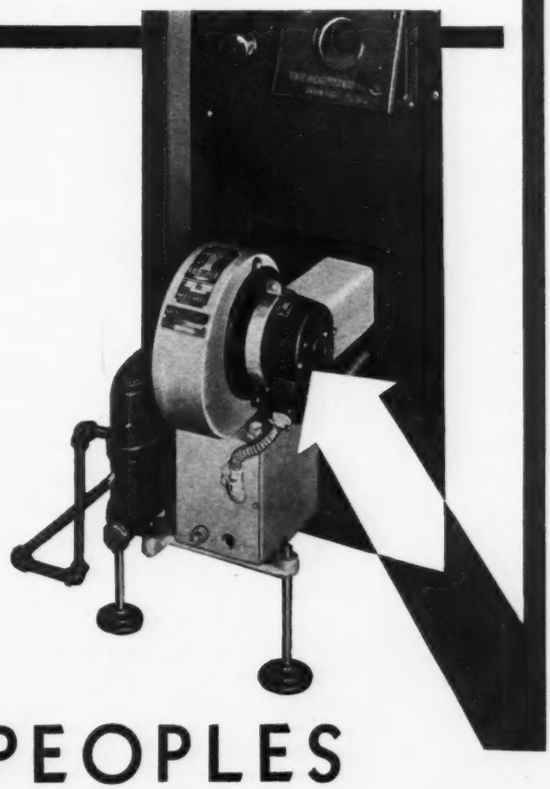

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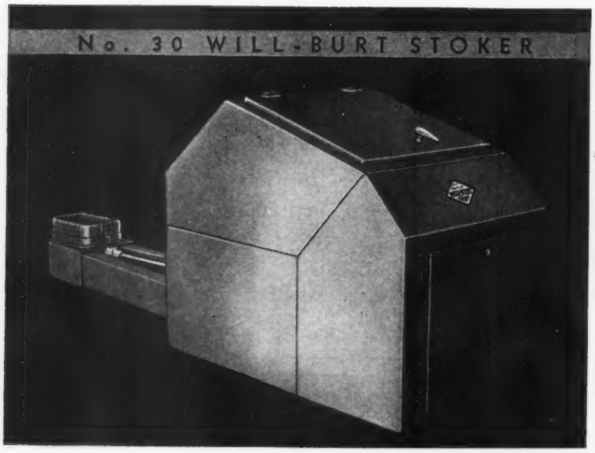


Office Cooling With Drying

(*Continued from page 39*)

conditions both Gel unit and main cooler may be in operation; or the cooler alone may be utilized. During the summer of 1935, the main cooler was deliberately prevented from operating in order to determine just how far dehumidifying alone would go. The blower continues to operate even with both cooler and dehumidifier off, in order to provide fresh air and circulation.

The blower is started by snapping the main switch on the control panel in the office. If the humidity is high, the humidistat starts the Silica Gel unit operating. If the temperature is high, the thermostat starts the cooler water flowing. Any or all of these operations may be going on at any time without conflict or dependence on the others. In many cases the Gel unit or dehumidifier will be in operation without the main cooler; thus correcting the old proverb, "it isn't the heat, it's the humidity."

Winter Operation

For winter operation, the thermostat controls the main gas burners. Blower operation is determined by a furnacestat; with limits of 125 degrees "on" and 110 degrees "off." The same blower is used for winter as well as summer; but the speeds are different. Winter speed is fixed at 860 R.P.M.; with a higher value (1160 R.P.M.) for summer.

Humidifying pans are placed on each of the heating sections. These are all connected together with copper tubing. The standard float control, in conjunction with the humidistat, maintains automatically the relative humidity desired during the winter.

Heat loss calculations for winter follow the line of standard practice and will therefore not be included in this article. Heat gain calculations and design conditions for summer operation follow:—

Outside—91 degrees D. B.
" —76 degrees W. B.
" —50% Rel. Hum.
" —110 grains/lb.
Inside—85 degrees D. B.
" —67.5 degrees W. B.
" —40% Rel. Hum.
" —70 grains/lb.

Total volume of space to be conditioned—16,500 cubic feet.

Maximum average number of occupants—20 people.

Sensible heat gain included that from walls, ceiling, glass, people and sun effect. Lights were disregarded, as the sun effect constituted the greater factor. Total sensible heat gain equalled 21,400 B.t.u./hour, plus that required for the fresh air based on four changes per hour.

Heat carried in by the fresh air =

$$\frac{16{,}500 \times 4}{55.5} \times (91 - 85) = 7{,}130 \text{ BTU/hr.}$$

Hence the *Total Sensible Heat Gain* equaled *28,530 B.T.U.* per *hour.*

Latent Heat or Moisture *Gain*:—

(a) From people:

$20 \times .15$ lbs./person/hr. $\times$ 7000 gr./lb. = 21,000 grains per hour.

(b) Fresh Air:

$$\frac{16{,}500 \times 4}{13.5 \text{ (cu. ft./lb.)}} \times (110 - 70) = 195{,}500 \text{ gr./hr.}$$

Total Latent Heat Gain equals 216,500 grains per hour = 31.0 lbs. water/hr.

31.0 $\times$ 1050 (latent heat of water) = 32,500 BTU/hr.

Total Heat Gain Load equals (28,530 plus 32,500) = 61,030 BTU/hr.

(1 ton refriger'n = 12,000BTU/hr.) $\frac{61{,}030}{12{,}000}$ = 5.1 tons

Amount of *Air* to be *Circulated* was calculated as follows:—

$$\frac{13.5 \text{ (cu. ft./lb. air)} \times 21{,}400 \text{ BTU/hr.}}{.24 \text{ (BTU/lb. air/degree)} \times 10 \text{ deg.} \times 60} = 2{,}000 \text{ cu. ft./min. approx.}$$

Add 10% for safety; design system for 2200 C.F.M.

Weight of *Air Treated* by the *Silica Gel Unit.*

Moisture to be removed equals 216,500 grains per hour.

At 65% efficiency of removal under the design conditions, the unit will remove 71 grains from each pound of entering air having an initial condition of 110 gr./lb.

Air required through Gel Unit =

$$\frac{216{,}500 \text{ grs./hr.}}{71 \text{ gr./lb. air} \times 60} \times 13.5 \text{ (cu. ft./lb. air)} = 688 \text{ C.F.M.}$$

A 1000 C.F.M. unit was specified to take care of future additional loads.

Water required for *cooling* at 70 degrees temperature.

$$\frac{2200 \text{ CFM} \times 10 \text{ deg. differential}}{55.5 \text{ (cu. ft. air/degree/BTU)}} = 400 \text{ BTU/min. to be removed.}$$

With entering water at 70 deg. F. and an assumed rise of 7 deg.:

$$\frac{400 \text{ BTU/min.}}{7 \text{ deg./lb.}} = 57 \text{ lbs. water/min.} = 6.85 \text{ gal./min.}$$

Water required for the *After Cooler:*

Temp. rise due to heat of adsorption equals

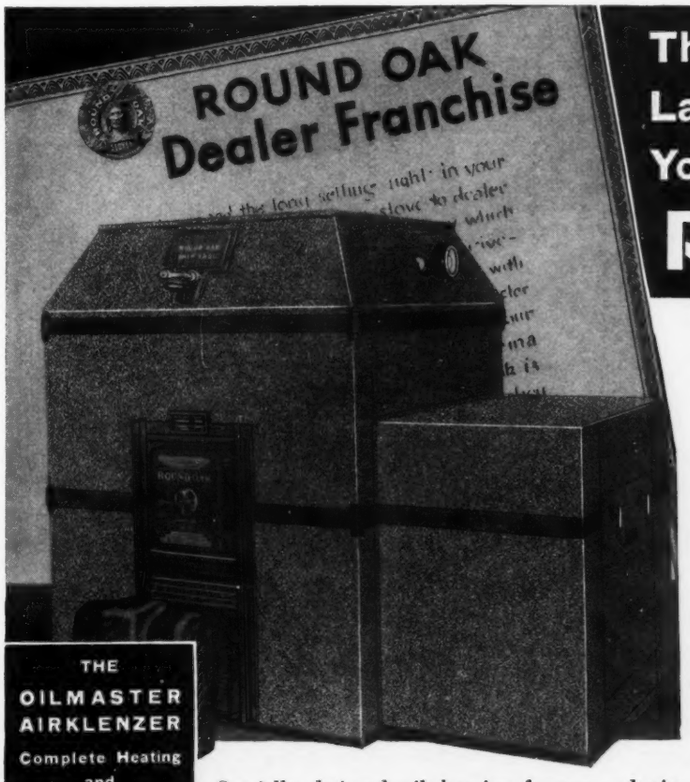
$$\frac{71 \text{ (grs. removed/lb. air)} \times 1300 \text{ BTU*}}{7000 \text{ grs./lb. of water} \times .24\dagger} = 54 \text{deg. F.}$$

Hence the temperature of the dried air leaving the Gel Unit and which is the entering air temperature for the After Cooler equals

(91 deg. + 54 deg. rise) = *145 degrees*

Outlet air temperature from the After Cooler is approximately 85 deg. F. This corresponds to an increase in water temp. of approx. 20 deg./lb.

*Latent heat/lb. of water plus heat of wetting.
†Spec. heat of air.



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Heat to be removed from the air during the path of flow through the After Cooler equals

$$\frac{1000\ \text{CFM} \times .24 \times (145 - 85)}{13.5\ \text{cu. ft./lb. air}} = 1070\ \text{BTU/min.}$$

Water Flow Required equals

$$\frac{1070\ \text{BTU}}{20\ \text{deg.} \times 8.33\ \text{lbs./gal.}} = 6.42\ \textit{gallons/min.}$$

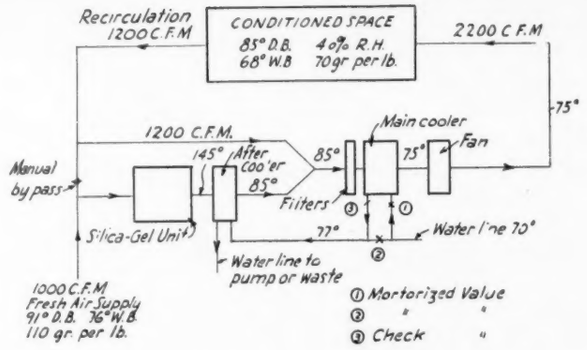
Since a flow of 6.85 gal./min. is available from the Main Cooler, the After Cooler requirement is more than fulfilled, the same flow being used after first passing through the Main Cooler.

The flow sheet for summer cycle shows how the water flow is automatically directed through the required paths. Two motorized valves, (1) and (2), are wired in with a double action thermostat. One leg of No. 2 valve is tied in with the humidistat. If both cooling and dehumidification are required, No. 1 valve opens and No. 2 valve closes.

Water then passes through both coolers. If dehumidification only is required, No. 1 valve closes and No. 2 valve opens, thus bypassing the main cooler. When the humidistat is satisfied, No. 2 valve is closed by the same break of current supply that stops the dehumidifier operation. Both valves require power to operate; and close by gravity when the power is off.

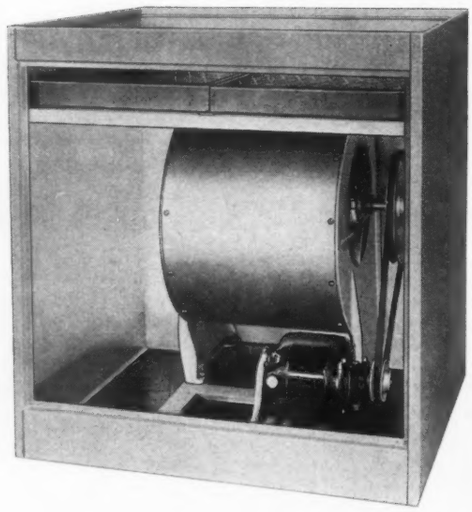
This arrangement permitted an interesting experiment to determine how far comfort air conditioning could be carried with dehumidification alone and without any sensible heat removal. The entire months of August, 1935, was devoted to this test, and the results proved to be highly gratifying. At no time during this period were the main cooling coils in operation. Indoor atmospheric conditions were varied from 40% to 35% relative humidity; with dry bulb temperatures paralleling those outdoors—from 80 to 90 degrees.

The reaction from employees and transient customers was unanimous as to perfect indoor conditions and comfort. It was difficult to believe that no difference in temperature existed, so apparent was the feeling of comfort. Furthermore, any objectionable body shock resulting from a 10 or 15 degree temperature differential was conspicuous by its absence in this plant.



FLOW SHEET FOR SUMMER CYCLE

This flow sheet shows movement of water through drying unit or by-passing dryer and the valves which control flow.



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7. Duo Speed Drive.

Price Per Pound

(*Continued from page 42*)

long from the gathering chamber to the first branch (H1). Our next section is 24″ by 8″ (H2). This section is 3 feet long. We next have an 11″ by 8″ duct, 3 feet long (H4) to catch the enclosed joist.

The return from the gathering chamber is run as a completely fabricated main and emptying into that duct are cold air returns panned under the joist. Where the return joist space from room 4 joins the main we have 2 feet of 11″ by 8″, 3 plus 2 (H6). We have a 14″ by 4″, 5 feet long (H7). We have a 14″ by 4″ duct going across into the next joist space where we are using a single face in the dining room to take in two joist spaces. This necessitates a short piece of duct from the one space to the other so that it can go in the joist. This duct catches our recreation return air, 14″ by 4″, 6 feet (H9). Our joist space to be covered takes a 13-inch cover for a joist. We have a 16-inch joist cover, 4 feet, 22 feet, 23 feet, 4 feet. The first is coming from bedroom, No. 10; the panning is 4 feet long of a 20-inch girth piece of metal. That includes the cover on the end, 18 inch girth. The second cold air coming from bedroom No. 9 is 22 feet long and 18-inch girth. The next is from living room No. 3 and is 23 feet long, and the next is the double-headed one referred to from dining room No. 4. That is, 4 and 4 are a total of 8 feet, and 18-inch girth for the metal, a total of 57 feet on the No. 1 return air duct.

No. 2 Return

No. 2 return air duct starts out with a 9″ by 13″ section (I 1). We have a transformer at this point going from a 9″ by 13″ duct into a 14″ by 8″. The 9″ by 13″ duct, 4 feet, the 14″ by 8″, 12 feet (I 2), that is from the transformer back to our first take-off. The 4″ by 8″ branch is 2 feet long (I 3). We then have a duct to our intersection at this point again, 11″ by 8″, 10 feet long (I 4). The 6″ by 8″ branch at this point (I 5), that comes from bedroom No. 8 is 3 feet long. This is the branch that connects to the cold air return coming from the living room. We have our closed-in joist space from this space that continues on in a crossed-in joint space, 18-inch birth plus 10 feet (I 7). That finishes our return air ducts in the basement.

Carried out the same way this gives us a total of 330 square feet of 26-gauge metal gives us a total of 300 pounds net. Our waste is 45 pounds, which is 345 pounds gross, allowing 15% for waste, seams, and cutting, giving us a gross poundage of 345 pounds of 26-gauge metal.

Our flue pipe in the basement is 8-inch pipe plus one 90-degree elbow, 10 feet, 24-gauge galvanized, 26 pound gross (J1).

Supply Risers

For our supply risers we have 12″ by 3½″, total of 43 feet (K3); 10″ by 3½″, total of 4 feet (K1);

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BARBER Burner Illustrated Catalog No. 37 is just off the press. It is an authoritative guide to the BEST in modern Gas Conversion Burner design for any make, size, or shape furnace or boiler. It shows 36 NEW models in Barber Burner Units. It includes the complete line of Barber Burners for numerous Gas-burning Appliances *outside* the house-heating field. It contains valuable engineering data on specifications, capacities, etc., also full information on automatic controls (including all-gas controls). You will find this Book of genuine assistance in your Gas Heating and Appliance problems. Ask for YOUR copy, with prices and discounts.

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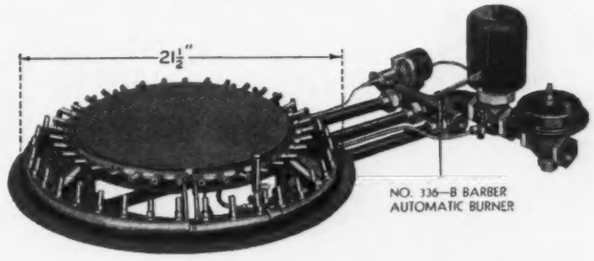

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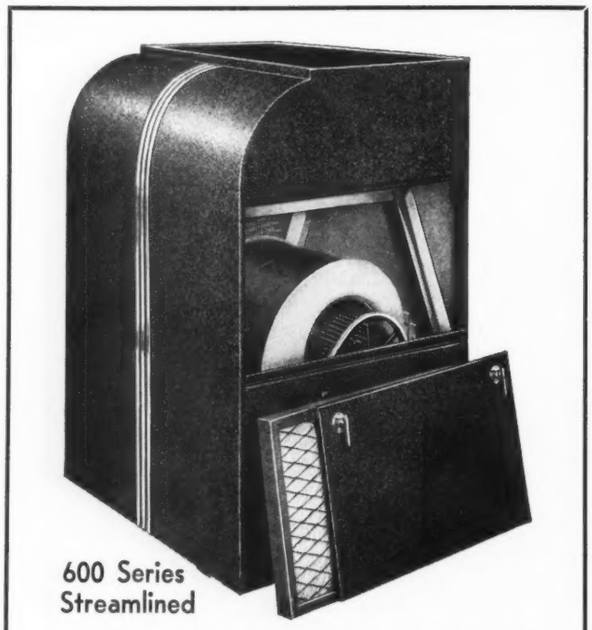

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13½" by 3½", total of 2 feet (K5); 12" by 3", total of 26 feet (K2); 13½" by 3", total of 4 feet (K4). That covers our supply risers to first and second floor, including our register, boxes, booths, elbows, crossovers, etc. The total poundage is 213 pounds gross, 26-gauge.

Our return air risers are— 13½" by 3", total of 22 feet (L1); 13½" by 3½", total of 34 feet (L2). That catches all our return air risers on this particular job. That gives a gross poundage of 163 pounds.

The total poundage for supplies, returns and risers is 1,164 pounds; allow 10% of our net weight for angles, hangers, etc., stiffenings, seams, etc., which is 101 pounds. Our net poundage is 1,013 pounds. The net poundage is 1,013 pounds and 15% allowance for seams, cutting, and other allowances, or a total of 1,164 pounds gross, and 10% of the net poundage added to this gives a total of 1,265 pounds.

Dampers

Oftentimes you say to yourself: "I will take such scrap and waste as I have for making the dampers whether they be volume dampers or splitter dampers, or whether they be second rate dampers." Irrespective of whether or not you are using scrap or cutting from straight sheets, the actual cost of the iron must be taken into account, so once more we have the cost of iron as the unknown quantity, plus the waste for cutting and fitting these dampers, to be taken into consideration.

In addition we suggest adding the cost of locking devices, and such little fittings cost anywhere from 12c or 14c to 21c per fitting.

For this job we will need—one damper, 3" by 7"; three dampers, 5" by 7"; two dampers, 6" by 7"; two dampers, 7" by 7"; one damper, 9" by 7"; one damper, 11" by 7".

Registers and Grilles

There is in addition the registers, faces, and grilles for the job. We have in the registers three 14" by 8"; one 10" by 4"; one 10" by 6"; four 12" by 8"; one 14" by 6"; and two 12" by 6". For cold air faces we will need—two 14" by 6" grilles; five 14" by 8"; and one 30" by 6". That gives you everything on the job so far as the total poundage of iron is concerned.

As a last cost we will need some insulating material. For example, if the pipe goes through cold fruit room we naturally insulate the pipe. Likewise, where we are forced to cross through unheated portions of the building, or use an outside wall to supply heat we insulate. In this particular installation we will use two layers of asbestos paper using one-half inch of insulation on the ducts in the part specified in this heating plan. In this particular plan, the item of insulation, using ½" air cell asbestos requires 1,042 square feet, which must be taken into account in figuring our cost on the job.

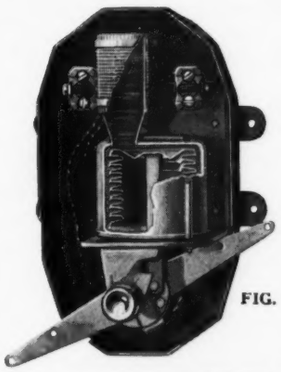

FIG. 1

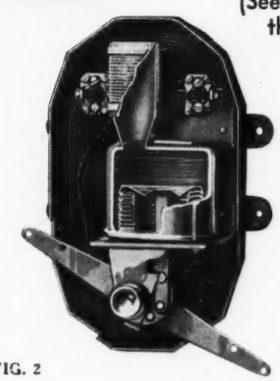

FIG. 2

SIMPLICITY

. . . in OPERATION . . . in INSTALLATION

DEPENDABILITY has been a distinguished characteristic of COOK Controls for years. Its simple, yet positive, electric vapor motor is the fundamental cause for its success. The vapor motor contains a spring tempered, phosphor bronze flexible metal bellows which is sealed into a drawn steel housing. The housing has a communicating chamber around which is wound an electric heating element. (See Figure 1). Electric current supplied to the element, generates heat and vaporizes a portion of the liquid. The expansion of the vapor compresses the metal bellows giving a direct power stroke. (See Figure 2). The stroke is steady and powerful and is applied directly to the operating arm eliminating all gears and bearings. There can be no gear noise, no magnetic hum, no lubrication problems, no service.

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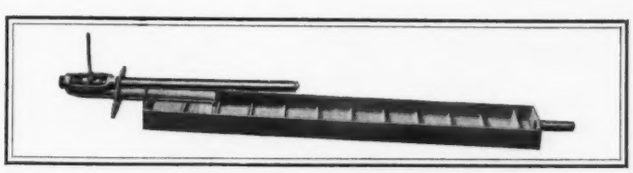

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CEDAR FALLS, IOWA

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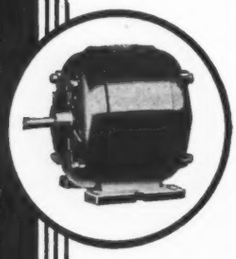

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Clarage Fan Company, Kalamazoo, Michigan

CLARAGE
Air Handling and Conditioning Equipment

Konzo Forced Air Facts

(*Continued from page* 31)

and to reduce the c.f.m. values so obtained when selecting the fan equipment. Actually, however, it may be considered good practice to ignore the difference in air volumes as determined by the two densities, and to assume that the selection of the fan is based on the total air volume as determined by the method indicated in Table 2. The slight discrepancy in the air volumes may be regarded as a factor of safety or as a factor to account for leakage of the air in the ducts between the fan and the registers.

C. Calculation of Air Densities

In the preceding discussion it was indicated that the value of the density of air was dependent on the temperature of the air. Since the air weight, the air density and the air volume are closely related, a short digression on the subject of air density will be of interest.

In the first place, the mathematical relationship of air density to its three component factors is partly dependent on experimental data. In the form adopted by the U. S. Weather Bureau the density, "d," is equal to:

$$d = \frac{1.3245\ (B - 0.378p)}{459 + t} \qquad (8)$$

where d = density of air, or the weight of 1 cu. ft. of air,

$$1.3245 = \frac{0.491 \times 144}{53.35}$$

from the constants involved in the equation for a perfect gas.

B = barometric pressure, in inches of mercury.
p = Vapor pressure of water vapor in atmosphere at temperature "t," in inches of mercury.
t = temperature, dry bulb, of air in degrees, Fahrenheit.

Equation (8) can be simplified to the following form:

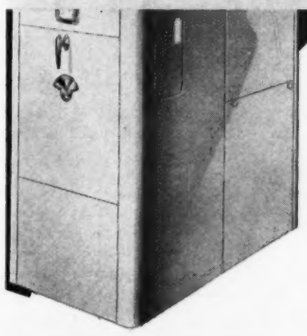
$$d = \frac{1.325\,B}{460 + t} \qquad (9)$$

This form, in which the vapor pressure is omitted, gives the density of dry air and in most cases is sufficiently accurate for ordinary engineering work. Furthermore, where the barometric pressure of sea level, or 29.92 in., is used, equation (9) can be further simplified to the approximate form:

$$d = \frac{39.65}{460 + t} \text{ or } \frac{40}{460 + t} \qquad (10)$$

The curves in Fig. 2 show a graphical representation of equation (9). For instance, air at a temperature of 70° F. and a barometric pressure of 29.92 in. has a density of 0.0749 lb. per cu. ft. (Follow up on the 70° temperature line. Follow across on the 29.92 in. line. The two lines intersect at the spot marked by "x," which lies approximately midway between the diagonal lines

A great advance in AIR CONDITIONING



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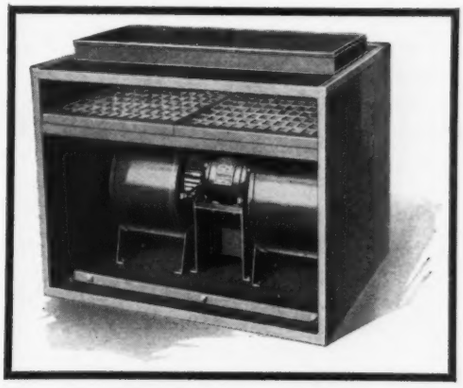

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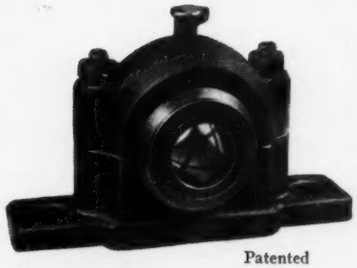

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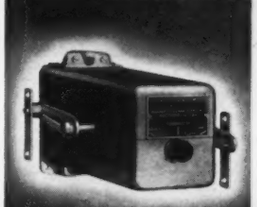

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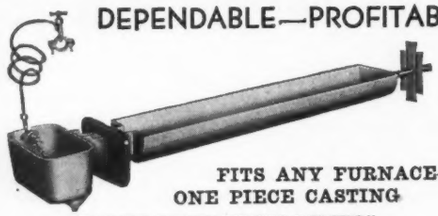

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representing 0.074 and 0.076 air density.) In a similar manner, air at a temperature of 140° F. and a barometric pressure of 29.10 in. has a density of 0.0652 lb. per cu. ft.

Similar data are presented in tabular form in Table 3. These data are only for dry air.

TABLE 3

Table of Air Densities for Dry Air

(Based on barometric pressure of 29.92 in. of Hg. See also Fig. 2)

Air Temperature Deg. F.	Density of Air, Lb. per Cu. Ft.
0	0.0862
10	0.0844
20	0.0828
30	0.0812
40	0.0795
50	0.0778
60	0.0763
70	0.0749
80	0.0736
90	0.0723
100	0.0710
110	0.0698
120	0.0686
130	0.0674
140	0.0663
150	0.0652
160	0.0641
170	0.0630
180	0.0621
190	0.0612
200	0.0604

D. Application and Limitation of Factor "55"

In some of the handbooks and catalogs, reference is made to a factor "55," which is regarded as the "number of cubic feet of air which 1 B.t.u. will raise 1 degree in temperature." The factor is a convenient one when properly used, but is limited in its application and hence should be used with discretion. The factor "55" is derived from the following set of conditions (see equations 3 and 5):

Heat delivery in B.t.u. per minute = c.f.m. $\times$ 0.24 $\times$ 0.0749 $\times$ $(t_{reg.} - t_{return})$, or (11)

$$\text{B.t.u. per minute} = \frac{\text{c.f.m.}}{55.6} \times (t_{reg.} - t_{return}) \quad (12)$$

When the air temperature is raised one degree F. the value in parenthesis becomes unity, and equation 12 simplifies to the approximate form:

$$\text{B.t.u. per minute} = \frac{\text{c.f.m.}}{55} \quad (13)$$

In other words, the factor "55" is equivalent to the "number of cu. ft. of air which one B.t.u. will raise one degree in temperature." Presumably if the "B.t.u. loss for a given room *per minute*" is known, the c.f.m. value can be determined readily by transposing the terms in equation (13) as follows:

$$\text{C.f.m.} = 55 \times (\text{B.t.u. per minute}) \quad (14)$$

The fact that the number "55" can be easily remembered and used, however, should not conceal the con-

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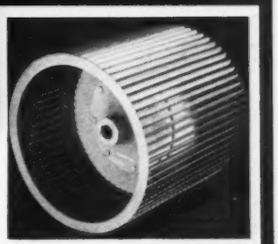

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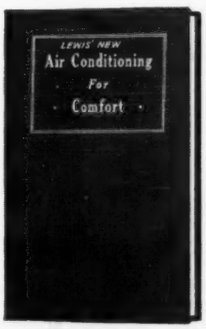

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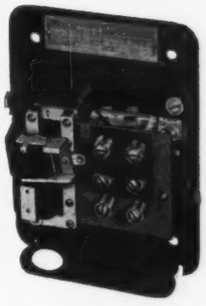

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dition that *its use is definitely limited to a density value of 0.0749,* as may be noted in equation (11). In other words, the c.f.m. values as determined by the use of factor "55" apply only to 70 deg. air at a barometric pressure of 29.92 in. of mercury. This is illustrated by Fig. 3, in which it may be noted that the factor increases with an increase in air temperature. In calcu-

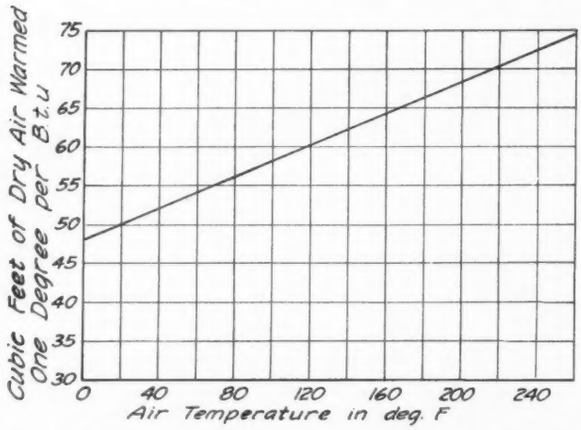

Fig. 3—Curve Showing Cubic Feet of dry air warmed one degree F. per B.t.u. Note that factor "55" applies only to 70 deg. F. air. (Based on dry air at a density of 29.92 ins. of mercury).

lating the air volume delivery at the supply registers, and in making determinations of the register and duct sizes, the temperature value of the warm air rather than the value of the 70 deg. air should be used. In view of the wide range in air temperatures that may exist in a given duct installation, the writer is of the opinion that the best procedure is to determine the c.f.m. values by the method shown in Table 1 and Fig. 1. As an alternate method, the values shown in Fig. 3 may be substituted in equations 13 and 14. The factor "55" should only be used when calculating the air volume for an air temperature of 70 deg. F.; in other words, the air volume at the fan inlet. If used to determine the air volume in the trunks, ducts, or registers, the c.f.m. values so obtained should be increased from 10 to 15 per cent.

This discussion of temperature drops will be continued in the next article.

Temperature Rise in Ducts

(*Continued from page* 50)

tion capacity or of operating cost can be had by insulating. But if the heat gain is a total loss, then it is usually easy to justify at least 1 inch of good insulation.

Loss for Rectangular Ducts

This discussion has been based on round ducts, but it may reasonably be expected that the temperature rise for rectangular ducts will be closely the same for ducts of the same frictional loss. This conclusion is based on the fact that the overall coefficient of heat transfer for rectangular ducts will be approximately the same as for round. The area of the rectangular duct of the same

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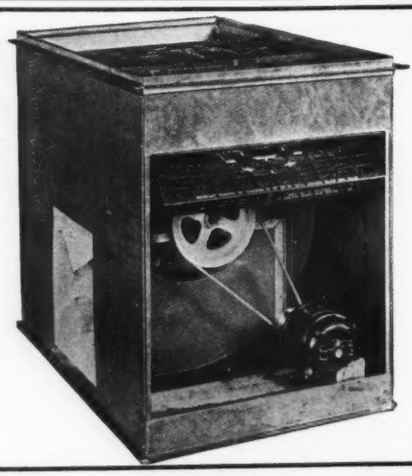

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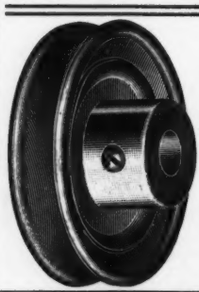

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friction loss will be greater than that of a round duct, but usually the placing of the duct with respect to its surroundings will have a greater effect on the results.

TABLE 1

Overall Coefficient of Heat Transfer for Cold Air Ducts
Bright Tin and Galvanized Sheet Metal

Duct Diameter in.	Air Velocity, FPM			
	400	800	1200	2400
4	0.49	0.54	0.59	0.63
8	0.43	0.49	0.52	0.55
12	0.40	0.45	0.58	0.51
24	0.35	0.40	0.42	0.45
Painted or Covered with 1 layer of Asbestos Paper				
4	0.78	0.97	1.1	1.2
8	0.71	0.89	0.98	1.1
12	0.67	0.85	0.94	1.07
24	0.61	0.78	0.87	1.0

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 100.

301—Room Cooling Unit

Westinghouse Electric & Manufacturing Company, 200 East Fifth Street, Mansfield, Ohio, has just published a new leaflet covering their Mobilaire—a self-contained room cooler—for the home or office.

The Westinghouse hermetically-sealed unit is contained in a steel cabinet in various finishes—burl walnut, mahogany, or modernistic design. It operates on ordinary alternating current . . . plugs into any light socket. Water and drain piping (simple copper tubes) are easily installed.

◆

302—Servel Air Conditioning

Servel, Inc., Commercial Refrigerator Division, Evansville, Indiana, is distributing a new folder entitled "Yesterday's Luxury Is Today's Necessity." The leaflet describes the Servel conditioners for large and small installations—small private offices or large commercial establishments.

◆

303—U. S. Coal Blower

U. S. Air Conditioning Corp., 2101 Kennedy St., N. E., Minneapolis, Minnesota, is distributing a folder with space for the dealer's imprint, describing and illustrating The U. S. Coal Blower, which they claim uses only the current of a small light bulb, is quiet, has a fool-proof motor which does not give radio interference, is serviced in principle U. S. cities, and provides automatic heat without attention.

◆

304—Air Conditioner Leaflet

Lewis Air Conditioners, Inc., 1600 Broadway, N. E., Minneapolis, Minnesota, is distributing a four-page, 8½x11 folder, with space for dealer imprint, illustrating and describing their new mechanical warm air conditioner. The conditioner consists of a new type furnace especially designed for oil burning and a blower, filter unit all housed within a modern type casing. Four sizes are available 120,000 to 225,000 B.t.u. bonnet output rating. C.f.m. ranges from 1,450 to 2,450.

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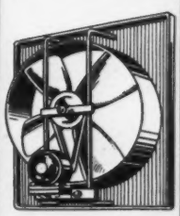

Complete industrial line. Important installations in many fields. Full information on models, diameters, and capacities upon request.

INTERNATIONAL ENGINEERING, Inc.
DAYTON, OHIO

The No. 85-CH. HUMIDIFIER

Pat. Pend.

—Easy to Install—

List price as shown $12.50
Send for circular A

MAID-O-MIST, Inc.

Is built of Bronze

—

It is fed by a reliable Water Feeder

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It is adjustable

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It is efficient

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Money back guarantee

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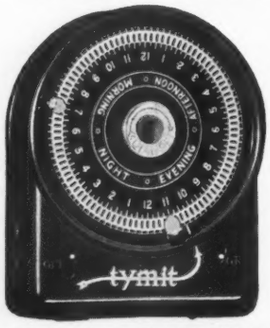
Low cost to dealer

182 N. Wacker Dr.
Chicago, Ill.

NIGHT AIR COOLING



A Tymit will automatically start or stop the Attic Fan or Furnace Fan every night regularly.

For A.C. Fan Motors up to ¾ H. P.

$8.05 net

TORK CLOCK COMPANY MT. VERNON, NEW YORK
Time Controls for Heating, Ventilating and Air Conditioning.
From the largest to the smallest.

Air Conditioning

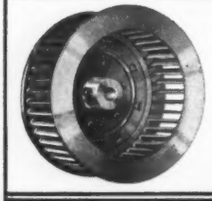
—What happens between two rooms, one having a six minute air change, and the adjoining room a twelve minute air change?

—Can you install a thermostat control system properly?

The answers to these and hundreds of other mechanical questions about air conditioning are appearing in the monthly *Air Conditioning Section* of AMERICAN ARTISAN.

If you do not now get the ARTISAN, send us $2 and we will enter your subscription for a full year—12 consecutive issues. Your subscription will yield a rich harvest of money making ideas and solutions to many mechanical problems connected with warm air heating and sheet metal contracting.

AMERICAN ARTISAN
6 North Michigan Ave. Chicago, Ill.



TORRINGTON
BLOWER WHEELS

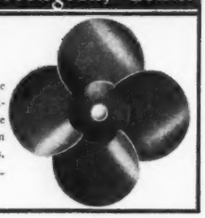
Made from a pressed aluminum alloy, which combines strength and light weight, Torrington Centrifugal Fan Wheels require less power for starting and operating. The patented construction minimizes resonance. Every wheel is accurately balanced. Send for descriptive bulletin showing correct dimensions for housing scrolls, also capacity rating sheets.

The Torrington Mfg. Co., *Torrington, Conn.*

AIRISTOCRAT
SILENT FANS

An outstanding development in the field of air impellers, having unique construction and attractive appearance, for which we claim quieter operation than any other propeller fan blade having comparable performance characteristics. The patented design embodies entirely new principles in the art of fan design. For free air applications and moderate pressures.

Send for bulletin describing small propeller fans 3" to 7" diameter for automobile heaters, automobile windshield defrosters, etc.



New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 100.

305—Air Filtering

Wilson & Co., Air Filter Division, 4100 South Ashland Avenue, Chicago, Illinois, is distributing a new folder entitled "A New Slant on Air Filtering" illustrating and describing Wilson's Spider-Web air filter.

◆

306—Emerson Exhaust Fans

The Emerson Electric Mfg. Co., 500 North 21st St., St. Louis, is distributing a new folder suitable for dealer distribution, entitled "A Change of Air Is Good for Any Business," setting forth the advantages of the Emerson two-speed ball-bearing exhaust fans for stores, offices, banks, churches, theatres, hospitals, hotels, schools, apartments, and for attic ventilation in the home.

◆

307—Air Conditioning Booklet

A new booklet entitled "Comfort Is in the Air" is announced by Bryant Heater Company, 17825 St. Clair Avenue, Cleveland, Ohio. The elaborate booklet in color shows by means of sketches and pictures what air conditioning is and explains summer conditioning, winter conditioning and year-round conditioning. Information is also presented on how these three phases differ and the types of apparatus required to furnish each particular type of conditioning. The company's line of winter air conditioners, gas fired; the gas fired boiler; unit type conditioner for basement installation and unit conditioner for room installation are shown and explained.

◆

308—Fan Data Sheet

Autovent Fan & Blower Company, Chicago, Illinois, announces their new performance data and price sheet, F-250, for 1936 covering complete line of two different types of propeller fans and accessory ventilating equipment. They especially feature the Autovent "31 Series" propeller fan embodying the non-overloading power characteristic feature which is most individual in propeller fan design. The fan wheel may be termed a limit load design as it will not churn air or overload the motor under conditions of normal restriction.

Complete new performance tables and prices on the "31 Series" Propeller Fans and "B-W" (Bucket Wheel) Propeller Fans, using the improved type of Blackman design wheel, are available in sizes from 12" to 72" diameter for all current characteristics.

◆

309—Air Conditioning Guide

Frigidaire Corporation, Dayton, Ohio, announce a new booklet "A Guide for Those Who Contemplate Air Conditioning." The booklet presents in plain language the facts which should be understood by anyone desiring to purchase air conditioning apparatus. The booklet starts out by describing the saving in apparatus and cost of installation by conditioning only a portion of the total area. Outside and inside design temperatures and what these things mean to the buyer are discussed and shown in detail. The common sources of heat, such as, persons, light, electrical appliances, etc., and the amount of heat given off by these sources is discussed. The importance of ventilation and how smoke, odors and heated air may be removed by ventilation is covered in complete detail. A section devoted to general design gives some facts about the appearance of the completed job. The salvage value is presented in such a way that the buyer can judge whether a central system or a room unit is best fitted for his needs. An important section of the book covers the cost of operation and the items of cost.

YOUR jobs depend on the FANS made by someone else—

Buffalo No. 181, 151, 121 "HVA" Fans. Note sturdy construction, streamlined inlet.

Be sure of your fans!

When YOUR heating, ventilating or air conditioning job goes wrong, YOU get the blame! Since the successful operation of any forced air system is dependent on the fan—be sure that you buy fans which will meet your requirements!

"Buffalo" has built fans for more than fifty years. Hundreds of designs have been tested in our own laboratory, and accurate test data compiled.

You may be sure, therefore, that Buffalo "HVA" Fans are ideal for the various services for which they are recommended—for forced air heating and cooling systems, for air conditioning work and for certain types of exhaust service. They are quiet, efficient, sturdy, practical.

Thousands in service are giving uninterrupted satisfaction.

Write for Bulletin 2947-A and Prices.

BUFFALO FORGE COMPANY
497 Broadway, Buffalo, N. Y.
In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" H. V. A. Fans deliver full rated capacity

A DEPENDABLE Damper Regulator Package in the LOW PRICED Field

The ELECTRIC JANITOR

THE standard Minneapolis-Honeywell Electric Janitor meets the demand for a damper regulator package in the low priced field. Included in this package is the heat leveling thermostat, a sturdy, efficient and dependable electric damper control motor, transformer and all necessary wiring and fittings. Despite its low price, the Electric Janitor package is representative of Minneapolis-Honeywell quality throughout. Other Minneapolis-Honeywell packages are available to meet the needs of every type of warm air installation. Minneapolis-Honeywell Regulator Co., 2726 4th Ave. So., Minneapolis, Minn. Branch and distributing offices in all principal cities. In Canada: Minneapolis-Honeywell Regulator Co., Ltd., 117 Peter Street, Toronto. European sales and services: N. V. Nederlandsche Minneapolis-Honeywell, Wijdesteeg 4, Amsterdam — C, Holland.

MINNEAPOLIS HONEYWELL

Control Systems

BROWN INSTRUMENTS FOR INDICATING, RECORDING, CONTROLLING

THE PROBLEM CORNER

Heat Loss Coefficients

American Artisan:

In the new houses, which are being built in this locality now, there are certain types of construction for which we are unable to find the correct heat loss coefficients.

We are enclosing sketch illustrating the various types of construction we have reference to, and would appreciate it very much if you could supply us with the correct information for the four types of construction, which we have listed.

What we want to know is the B.t.u. loss per hour per square foot of surface per degree difference in temperature for, First, through roof and ceiling, as illustrated in "A."
Second, through an interior wall, as shown in "B."

Third, the overall loss through the ceiling and roof, as shown in "C."

Fourth, through a standard brick veneer wall, as illustrated in "D."

In each of these four cases, we would like to know the proper coefficients for both 3⅝" of rock wool insulation and also for 2" of rock wool insulation. If you have any tables illustrating any other types of insulation or can advise us where they may be obtained, we would appreciate it very much. **L. T. P., Kentucky.**

Reply by the Editors

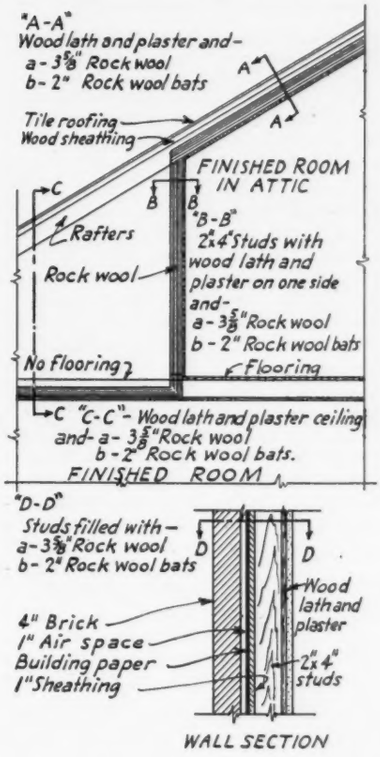
Answering your letter in the order of your questions: The co-efficient of heat transmission through the roof at point A for 3⅝ in. of Rock Wool is 0.064, as given on page 124 of the 1936 A. S. H. V. E. Guide The coefficient of heat transmission for a partition wall, as indicated at B, is 0.065 for 3⅝ in. of Rock Wool. However, you say there is lath and plaster on only one side, but in order to use Rock Wool, you must have some sort of a cover to hold the insulation in place. Accordingly, I think the Guide coefficient is quite all right, even though it is for a double partition.

The coefficient of heat transmission for a ceiling and roof in the unheated area, as indicated by C, must be derived from the formula:

$$U = \frac{Ur \times Uce}{n \times Ur + Uce} \ldots \ldots \ldots$$

Please note the item *n* must be calculated according to the proportionate area of roof to ceiling and accordingly, I am unable to work out the formula for you. Just in case you do not have a copy of the Guide, I quote with regard to this formula as follows:

"In using this formula, a correction factor must be applied. As the amount of heat transferred through an air space is proportional to the difference of the fourth powers of the absolute temperatures of the surfaces enclosing the air space, a greater



WALL SECTION

amount of heat is absorbed or emitted by radiation by the surfaces enclosing an unheated attic than by the surfaces of a wall or ceiling in a room under still-air conditions, where the surrounding objects are only slightly higher in temperature than the interior surfaces of the walls and ceiling. For example, the average coefficient of a surface in still air is 1.65 B.t.u. per hour per square foot per degree Fahrenheit, whereas the average coefficient of an air space in an outside wall is about 1.10 B.t.u. per hour per square foot per degree Fahrenheit difference between the two surfaces, at a mean temperature of 40 degrees F. An air space coefficient of 1.10 is equivalent to a surface coefficient of 2.20 for each of the two surfaces enclosing the air space, where the over-all transmission is computed by using the coefficients of the two surfaces enclosing the air space instead of the coefficient of the air space itself. Hence, in determining the values of Ur and Uce to be used in the formula, the coefficients for the surfaces of the roof and ceiling enclosing the attic should be increased to allow for the additional amount of heat transferred by radiation, and a coefficient of 2.20 may be used with sufficient accuracy for each of these surfaces, although in very precise work a correction should be made to allow for the fact that the area of a pitched roof over an unheated attic is greater than the area of the ceiling, and hence, the amount of heat absorbed by radiation by each square foot of roof surface is less than is given off by radiation by each square foot of ceiling surface.

"If the unheated attic space between the roof and ceiling had no dormers, windows or vertical wall surfaces, the combined coefficients may be used for determining the heat loss through the roof construction between the attic and top-floor ceiling, but it should be noted that these coefficients should be multiplied by the roof area and not by the ceiling area. If the unheated attic contains windows, ventilators or vertical wall surfaces, which would tend to reduce temperature in the attic to a temperature approaching or equalling the outside temperature, the roof should be neglected and only the top-floor ceiling construction and the corresponding ceiling area taken into consideration, using the coefficients given in Tables 8 or 9. Where there are no dormers, windows or doors, and when the transmission coefficients of the roof and the ceiling are approximately the same, the value of the attic temperature may be taken as an average between the inside and the outside temperature."

The coefficient of transmission for the brick veneer wall, as indicated by Sketch D, is 0.062, using metal lath. This is given on page 117 of the '36

The Problem Corner . . . . .

Guide, with the note that the same coefficient can be used for wood lath or plaster board.

In all cases above, I have quoted for 3⅝ in. of Rock Wool. I do not have any information for 2-in. Rock Wool, but you might write to Rock Wool Products Company, Inc., Washington, D. C. and see whether or not they have any information on the reduced thickness. The 2-in. material would have to be in bat form, else it would not be self-sustaining in vertical sections.

◆

Pipe Sizes

American Artisan:

Last year I saw a table that had heat losses and pipe areas required for different rooms having given lengths, widths, heights, exposed sides and window areas. The man who had the table said it figured very close to the Standard Code, but was not sure where he secured the table. Have you seen this table and if so where can we get a copy?

C. G. R., Ohio.

Reply by the Editors

There are numerous tables showing pipe sizes for given velocities and c. f. m., but we do not know of any table in which complete room dimensions and window areas are charted against heat loss and pipe area. It sounds as though such a table, if it exists, may have been compiled by one of the manufacturers.

One of the manufacturers recently published a calculator which shows the square inches of pipe area for different heat losses and different velocities. This is a very simple calculator, working on the slide rule principle. Has any reader seen a table of this kind?

◆

Apartment Building

American Artisan:

We have a prospective air conditioning job in a new building 50 by 140 feet, two stories high. There are store rooms on the first floor and 20 apartment offices on the second. Can you refer us to any similar jobs which are successful? The building will be built around the conditioning system and the owner wants the building heated in winter and cooled in summer.

Fuel for heating will be gas. Cooling will be with well water through sprays.

W. E. R., Montana.

Reply by the Editors

We regret to say that we do not recall any installation which exactly meets the specifications of your letter. We know of several similar buildings cooled by ventilation; others cooled by means of cold water and coils, and others cooled by spray water with refrigeration.

We believe that we can be of most assistance to you by referring your letter to several manufacturers who undoubtedly have done work of this type. We, accordingly, are sending a copy of your request to several well known firms.

Should these suggestions not result in satisfactory information, we shall be glad to submit your problem to an engineer or two, asking them to give you suggestions. [Any reader having a system of this kind and wishing to make suggestions may do so through the magazine.]

Lime Deposits

In reply to the question of S. C., Michigan—"what becomes of mineral matter in water that is delivered into the circulating air of furnaces by the spray type humidifiers."

During periods when the air in the furnace bonnet is hot enough all the water sprayed into the furnace bonnet is converted into water vapor, but the mineral salts, not being vaporizeable, remain in the air as microscopically fine dust—so fine that it is carried by the air currents into the rooms. In the rooms, the air is quiet enough to permit the lime to settle as fine dust over the room furnishings.

In districts where the water is heavily charged with lime, etc. this dust is very noticeable. It is not considered healthful by physicians to breathe the mineral dust and some people detect a distinct limey odor.

During periods when the bonnet temperature is too low to evaporate all the water sprayed into it, the tiny spray globules settle upon the interior parts of the furnace. The water evaporates but the mineral salts remain to give the furnace interior a "slobbered up" appearance. The extent of this slobbering depends upon the design of the spray equipment.

O. J. Kuenhold,
Monmouth Products Co.

Heat Loss

American Artisan:

Please answer the following questons:

1. What is the heat loss coefficients of 7" timber wall and 8" timber wall, plain and with paper and sheathing; 18" limestone wall, 24" limestone wall and 28" limestone wall, plain and one side plastered.

2. Which way to figure the installations of hot water heating systems in buildings?

Could the heat loss be figured the same way as for Warm Air Heating?

How many B.t.u.'s a square foot for radiator surface of hot water radiator or steam.

V. J. K., Estonia, Europe.

Reply by the Editors

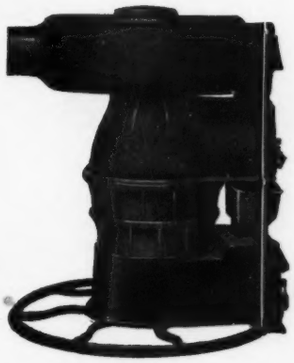
The 1936 Guide of the American Society of Heating and Ventilating Engineers gives the following coefficients for a 16-inch limestone wall with one-half inch of plaster applied on the wall without lath and without furring—0.45; for a 24-inch wall, same construction—0.35. No coefficient is given for a 28-inch wall, but it would probably be about 0.30.

We cannot tell from your letter whether you mean for the 7- and 8-inch timber wall a hand-hewn log or plank construction. In any case, no coefficient is given in any of the books we have available for either of these types of construction and it would be necessary to figure the heat loss from the basic heat loss formula in which case it would be necessary to know the type of wood as the coefficient of conductivity varies from 1.01 for hard maple to 0.78 for pine. If you will tell us exactly what construction you have in mind we shall be glad to inquire from some of the authorities just what this coefficient should be.

In answer to your problem No. 2, the basic heat loss calculations are the same for all types of heating—in other words, we arrive at the total B.t.u. loss for the house by the same method whether we propose to heat by air, water, steam or even electricity. When the total heat loss for the building is calculated and we propose to use steam heating system, we figure the number of square feet of radiation for steam on the basis of 240 B.t.u. per hour per square foot of direct radiation. For gravity hot water heating systems we use 150 B.t.u. per hour per square foot of radiation on the basis of 180 degree initial water temperature and 165 degree return water temperature.

We believe that the most comprehensive book covering all types of heating and containing the most up-to-date information is the 1936 A. S. H. & V. E. Guide, price $5.00. There are a number of books covering steam, hot water or warm air heating but the Guide covers all types as well as other phases of heating, ventilating and air conditioning.

A Fast Selling Line of Fine Furnaces!



Built of cast iron—the long life metal

The ECONOMY *Blue Front* Furnace

More Economy Blue Front Furnaces have been sold so far in 1936 than the corresponding period of any year since the inception of the Company 96 years ago.

There must be a reason.

Perhaps it is because overnight delivery can be obtained from stocks carried in 80 principal distributing centers.

Perhaps it is because the Economy—designed for satisfactory household heating, has the largest radiator surface of all furnaces — slip fronts — one piece feed section—is modernized in all respects.

Built of cast iron—the long life metal

The ECONOMY *Square Cased* Furnace For Gravity and Air Conditioning

Built around the Economy Blue Front is the square cased gravity and square cased air conditioning equipment. Using fully insulated 20 gauge enameled steel casings, instead of light weight black or galvanized iron, enables you to offer the builder or home owner a product that from an appearance standpoint cannot be approached. Comes complete with Plenum Chamber.

Built of cast iron—the long life metal

The CARTON *Self Cleaning* Furnace

A furnace that never needs cleaning—there is no place for soot to lodge. Out of the competitive class, yet priced within reach of any owner. Carton Furnace dealers never give up the Agency. There is no better furnace made. For nearly a century—the Carton (one 75 years old was displayed at the Chicago World Fair) has been ranked first among fine furnaces.

Get the Agency!

If available in your territory, the International Agency can be made your most valuable asset.

New cast iron air conditioner for oil only—warm air equipment for all fuels and all requirements—as well as complete steam and hot water equipment—can be had under the one name—INTERNATIONAL.

Write for compete information and location of nearest stock.

INTERNATIONAL HEATER COMPANY

UTICA, N.Y., U.S.A.

NWAH&ACA Winter Meeting

The Winter Meeting of the National Warm Air Heating and Air Conditioning Association will be held at the Stevens Hotel, Chicago, Illinois, on December 15, 16 and 17, 1936.

Allen W. Williams,
Managing Director.

◆

Philadelphia

The Warm Air Heating and Air Conditioning class, led by B. F. John, will continue every two weeks during the summer at the request of its members. The lessons are given simply and clearly and have created quite an enthusiastic interest. Several salesmen of furnace and fan manufacturers are attending. A strong future organization may possibly result. The lessons started from scratch, giving fundamentals of heating and air conditioning through the Standard Code for gravity and forced air to air conditioning. The B. t. u. method seems simple after being explained in this manner.

The roofing advertisement in the daily papers continued for three months and will be renewed in September.

Business keeps up in general among the shops and the old seasonal Fall rush is expected before September.

F. U. Ritter,
Secretary.

◆

New Jersey

The Air Conditioners Association of New Jersey, 405 Federal Trust Building, Newark, N. J., was entertained at its August 3rd meeting by a motion picture story of controls presented by Harold L. Steinfeld of the Minneapolis-Honeywell Regulator Company.

Edwin A. Scott, editor and publisher, delivered an interesting address on the subject of air conditioning and the advantages of air conditioning associations at the July 6 meeting in the air conditioned auditorium in the Public Service Building of Orange, N. J.

At the September meeting, the association plans to have a motion picture story of modern air conditioning presented by an official of the Public Service Gas and Electric Company. During that month the association plans to visit and inspect the air conditioning system installed in the new ocean liner Queen Mary.

President Anthony Menke, 24 Commerce St., Newark, invites communications from other associations, which he will present at the meetings. It is the desire and intention of the association to co-operate with similar associations throughout the country.

Anthony Menke,
President.

◆

Fort Wayne

The Sheet Metal and Warm Air Heating Contractors' Association of Fort Wayne has called a recess until September, excepting for the activities of a committee appointed to draft a new city ordinance—no small task when present day requirements and all features required by the industry are considered. It is expected that this will be the principal activity during the fall program.

There seems to be an extreme demand for complete automatic heat mechanical conversions in this locality at the present time.

Perhaps your readers will be interested in this incident:

A sheet metal contractor answered a call recently where a canvasser (identity unknown) had called and endeavored to get repair work. This particular furnace required no attention, although the canvasser advised resetting. Failing to close the contract, he made a second call and was advised that the owner was intending to call another dealer to get the low down before they let any contracts, whereupon he asserted the work would not be done by any other dealer as they did it because the most vital part of the work was usually omitted—the job was done all in one day and that they took two. The first day they took the furnace down and thoroughly cleaned the castings, and placed them to soak over night and reset the job the next day, stating that the soaking was very essential to the success of resetting any furnace, and not to permit any furnace man to do the work who did not soak their castings as was done by their outfit.

The local dealer was the lucky one, however, and sold a thermostat, a humidifier and the owner is apparently happy.

Charles E. Tharp,
Secretary.

◆

Indiana

The Indianapolis and State Associations, the Sheet Metal, Warm Air Heating and Roofing Contractors' Association of Indianapolis and the Sheet Metal, Warm Air Heating and Roofing Contractors Association of Indiana—jointly sponsored a sheet metal picnic recently.

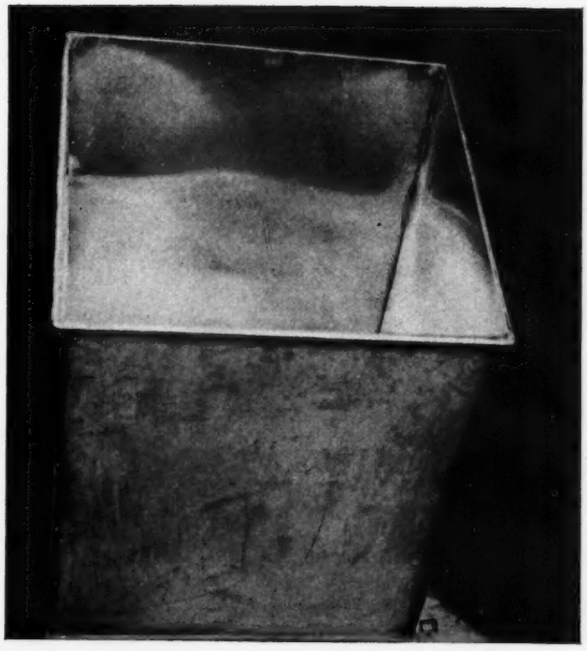
There were prizes and free pop and ice cream. George Joslin, chairman of the prize committee, saw that all of the children and most of the ladies left the picnic ground with something to show for their competitive ability.

The Furmets were accorded a victory by a score of 14 to 8 by the harassed score-keeper at the ball game in the morning.

The Olympic Games which took up the major part of the afternoon furnished the following champions: Sack Race—Howard Tout; 50-yard dash for men—Francis DeLong; 50-yard dash for women — Mrs. Charles Doyle; clothes pin contest for women—Mrs. Charles Doyle, time 17 9/10 seconds; clothes pin contest for men—Floyd Lively, no time taken; cracker eating contest — Mrs. Charles McManama; Rolling Pin Throwing Contest—Mrs. Charles Doyle (poor Charlie); Rolling Pin Throwing Contest for Men—Jess Brooks and John J. Gorman (tie); Backward run—Mrs. Bob Renick.

Paul R. Jordan,
Executive Secretary.

Fabrication Hints for Stainless Steel Tanks*



Heat color marks were easily removed from the finished tank by the use of scouring powder.

OBSERVATION of work carried out by fabricators, particularly of work on the newer materials, such as the various types of stainless steels, is often well worth while because of the fact that each new job of this kind represents new problems or independently developed methods of handling. Recent work carried out in the fabrication of a stainless steel tank by a company that had but little previous experience with this type of material will be, therefore, of interest to others doing similar work. The company in question are sheet metal workers and have not been equipped for welding for any great length of time. They are now specializing and going after jobs of this kind aggressively.

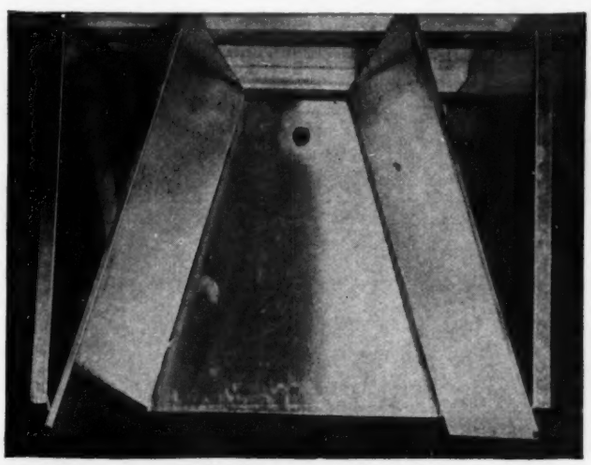
An order had been received for several sulphur dye tanks to be fabricated by oxy-acetylene welding 16-gauge stainless steel of a type known as "disintegration-proof." One of the completed tanks is shown in an accompanying illustration. It will be seen that the sides and bottom are each of one single sheet of material.

A ½-in. flange was turned up on each edge by a power press to give a good square corner and to stiffen the finished tank. It was also noticed that this type of design helped considerably in keeping the edges in line for welding. Small U-type clamps were used to hold the edges of adjacent sheets together and in place while the sheets were tack-welded. The tack-welds were spaced at intervals of 2½ to 3 in. and made along the edge in one direction only from end to end. Likewise the welding of the seam itself was carried out in one direction only, beginning at one end and not stopping until the other end was reached. It is interesting to note that the edges of the material were thoroughly filed clean and free from oxide after tack-welding and then the whole seam painted with Cromaloy flux before the final weld was made.

A blowpipe tip one size smaller

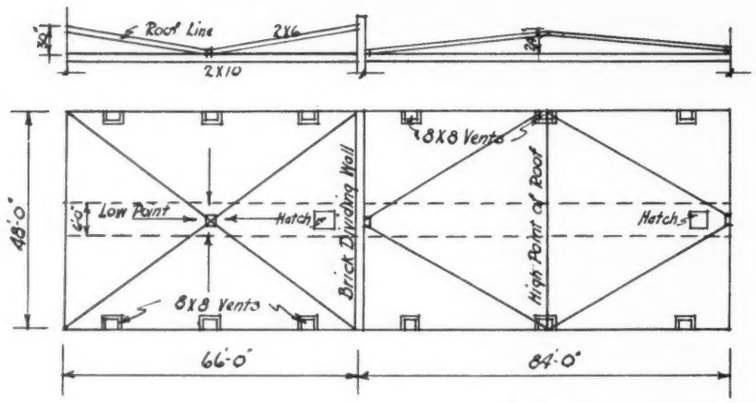
(*Continued on page* 84)

*Article reprinted from Oxy-Acetylene Tips, July, 1936, by courtesy of the Linde Air Products Co., New York City.



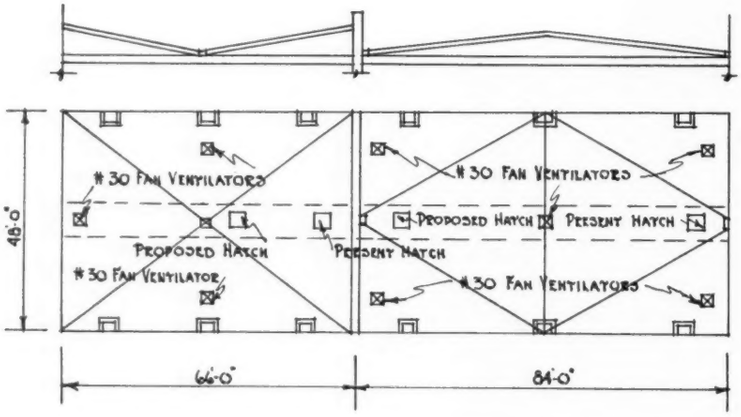
Cromaloy flux materially aided the welding of this metal.

Sulphur dye tank of stainless steel showing the edges of the sheet flanged before welding.



Note - Dotted Lines Represent Reflected Plan of Half-Way

THE PROBLEM



THE SOLUTION

Ventilating An Attic

This layout simply contemplates relief from solar heat. What is called positive night air cooling would call for at least 300 cubic feet of air per hour for each square foot of attic area.

By Paul R. Jordan

Indianapolis, Ind.

"We are enclosing a sketch of an attic cooling problem. Our customer will not consider ceiling registers in the apartments. Therefore, the layout must utilize the corridor intakes and the numerous 8" x 8" vents which are not being used. Can these vents be used as intakes by cutting into them between the roof deck and ceiling?

"In addition to ventilating the attic space, the customer is considering the installation of 2 inches of insulation over the plastered ceiling. We hesitate to recommend this, as we feel that it may only retard the inflow of heat for a longer period of time which is offset by its longer heat storage capacity during the night. We would appreciate your comments on this subject."

◆ ◆

THIS building has in effect two attics or roof spaces. The larger roof slopes four ways to the center and also four ways to each corner with a valley midway between the center and each corner.

There are two problems—capacity and distribution. The capacity can be figured on the basis of the roof space formula as follows: 84 times 48 gives 4,032 square feet of roof space. Multiply this by 80 gives 322,560 cubic feet of air per hour.

Distribution

As to distribution, first consider the intake. The 8 by 8-inch ventilators open directly to the outside from the roof space. It will be better to stop these up, and introduce air into the roof space from the corridor of the apartment below. This will have a very beneficial effect on the corridor and on the apartments of that floor. In effect we will be using the air twice, once to ventilate and cool the apartments and corridor, and a second time to ventilate and cool the roof space.

The location of the intakes into the roof space from the corridor will depend on the location of the exhausting units. Usually it is desirable to place one exhausting unit at the highest point of each of the sections of the roof. This will give five exhausting units, one at each corner and one in the center. (See sketch.)

Intakes

In considering the location of the intakes through which air is drawn from the corridor we have one hatch which is well located. In addition to this there should be another hatch similarly located at the north end of the roof space as indicated on the sketch. If only one hatch were used, it would probably be insufficient in area. Also it would not give proper air distribution to the north end of the attic, especially at the middle. The two hatches must have at least 10 square feet of area.

C. F. M. Per Fan

Since we have decided to have five exhausting units, our distribution will best be taken care of by an equal division of the ca-

(*Continued on page* 91)

AND NOW IT'S **CHRONAT:**

THE BRAND THAT HAS ALWAYS IDENTIFIED A HIGH GRADE FIRE RESISTING IRON--HERETOFORE ONLY USED ON SPECIAL CASTINGS--NOW USED IN ALL NATIONAL REPAIR PARTS--NO INCREASE IN YOUR COST.

CHRONAT RESISTS FIRE AS STAINLESS STEEL RESISTS RUST.

A NEW REPAIR SERVICE YOU CAN NOW OFFER YOUR CUSTOMERS AT PRICES EVEN LOWER THAN ORDINARY IRON.

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SEND FOR SALES LITERATURE AND SALES HELP TO TELL YOU AND YOUR CUSTOMER MORE ABOUT CHRONAT.

THE NATIONAL FOUNDRY &
FURNACE COMPANY
DAYTON, OHIO

Speculative Houses

(*Continued from page* 15)

Here, too, only a few blowers and thermostats have been installed—extras which are sold to home buyers practically at cost. Mr. Koeln, who handles the sales and contract work, believes winter air conditioning and other advanced heating arrangements are a matter of educating the public to their advantage in comfort, convenience and economy.

Chicago

Most pretentious of the heating systems in small homes are those at Ivanhoe, a suburb, bordering the southern line of Chicago. It is being developed by Mills & Sons and embraces an acreage large enough for more than 3,300 homes.

The Mills' homes, partly because of the high land costs, pavement and utility connections already in, run from $5,500 to $8,850 in price, depending upon location and type and size of dwelling desired. Homes are built to order, but nine separate standard plans are being offered the public for selection.

The heating plants and systems used in the standard model home are 100 per cent warm air with variations—that is, gravity, winter air conditioned and year-round air conditioned. Two types of furnaces are used—round and square; also two different makes—Lockinvar and Niagara. Coal, oil and gas are recommended as fuels, and the installed furnaces are equipped as selected.

A Lockinvar furnace, an oil burner has been installed in a $5,500 home. A winter air conditioned Niagara has been installed in an $8,850 dwelling. Three have gravity Niagara furnaces, the cost for the houses ranging from $6,650 to $6,950. These buildings measure 23x41.1, 24x29.1 and 24.1x44.4 feet. An $8,600 home, colonial in design, has an air conditioned Niagara furnace with an Iron Fireman stoker attached, while an English cottage, selling for $8,250 is heated with an air conditioned Niagara furnace, hand fired. A gas fired, air conditioned Niagara furnace was installed in another English cottage selling for $8,500. The building measures 25.8x53.8 and is on a 42-foot corner lot.

With all exposed walls and roof insulated, the cost of heating the buildings in the Mills & Sons development will be relatively small, depending upon the fuel. Purchasers have the choice of heating plants and system even to other than those in the models.

A little different set-up makes the development at Markham southwest of Chicago, unfavorable to warm air heating. Using a service room instead of a cellar, it was feared there would be too many elbows and that registers would necessarily have to be placed high up in the walls.

Warm air was figured on in determining the cost of the homes, more than 90 of which were sold from black and white sketches and floor plans before a shovel of earth was turned, as a matter of keeping down the price. According to the Fred J. Walsh Company, several contractors were unfavorable to this item, but the original intention of furnaces equipped for winter air conditioning has been carried out in 15 to 20 of the homes. The comparison of heating systems will be interesting to observe.

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Easy operation, accurate work, adjustable for sharp or rounded bends, completely equipped with gages and stops for narrow or wide bends at desired angles, clamps and folds in one operation, 17" to 60" working lengths, 20 and 22 gage capacity.

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Snips—Stakes—Hand Tools

NIAGARA MACHINE & TOOL WORKS, BUFFALO, N. Y.

NIAGARA

Skylight Construction

(*Continued from page* 17)

shown in Fig. 8 from *j* to *V* to *W* and place it below the line *O-j* in Fig. 10 as shown by similar letters. In Fig. 8 take a reproduction of the angles *i-r-f* at the ridge and *A-O* at the curb and place them in Fig. 10 on the line *r-O* as shown by *i-r-f* and *A-O*. Now reproduce the half common bar in Fig. 9 as shown in Fig. 10 which completes the pattern for one-half the gable end with the half bar attached to the pitch line *A-f* and half of the curb at the bottom. Laps should be allowed as shown by the dotted line for a vertical riveted and soldered joint, or for a standing seam joint as indicated in the two sketches at the right.

Bar Caps

When capping the bars a V-capping is used as shown in Fig. 11. The first drawing shows a slot cut in the bar, into which soft copper cleats, one-half inch wide and doubled over, are inserted and soldered or riveted. The second drawing shows the cap in position with slot cut in the cap. The capping is pressed down firmly onto the glass, the cleat cut off, and each leg of the cleat dressed down with the hammer. When the skylight is of galvanized iron, tin the copper cleats. On a skylight of the size given in Fig. 6 place two cleats on each bar; two inches from top and bottom.

After the skylight is erected on the job and before glazing, place a wood screw shown by C in Fig. 8 in the center of every other light of glass and solder the flat head. The drip flange of the curb all around the skylight is secured to the wood frame with round head brass screws and lead washers shown by *a* and *b* which are spaced about 24 inches apart.

Estimating Quantities

When computing the quantities in a double pitch skylight the estimator usually scales the size of the curb from the architect's blue prints, multiplies the length by the pitch of one side and multiplies by two for both sides which gives the number of square feet which are priced at so much per square foot. This is a simple method when previous jobs have given an approximate cost price.

The accurate rule for finding the true quantities of material is given as follows: This method may take a little more time, but saves considerable loss when large skylights of any type are constructed of copper. Here an error in finding the true quantities may eat up the profits.

The skylight in question (Fig. 6) has a curb measure of 3 ft. 6 in. by 9 ft. 4 in. and is divided in 8 divisions of 14 inches each. For the curb at the foot of the pitched sides we know from previous jobs that it has a girth of 5 in. The length of the curb is 112 in. $5 \times 112 = 560 \times 2 = 1120$ sq. in. for two sides. The complete girth of the ridge bar requires $11.5 \times 112 = 1288$ sq. in. The full girth for the common bar and cap requires 5.75 inches. The accurate length of the common bar can be computed by first finding the factor applicable to one-third pitches. Refer to the diagram in Fig. 8, find the length of the hypotenuse by extracting the

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and then some more . . .

- Peerless Duplex Grates
- Large cleanout door
- Full cast iron front needs only two bolts
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- Large Water Coil
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- All Door Hinge Brackets are Detachable

In addition to all these features it is priced so low that it makes it practically impossible for anyone to continue with an inferior heating plant. It is the furnace that your customers are seeking . . . that you can sell them with the assurance of perfect performance . . . and that will make you a nice profit with each installation. Start selling them NOW.

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PEERLESS HOME HEATING EQUIPMENT . . .

square root of the sums of base and altitude thus $\sqrt{3^2 + 4.5^2} = 5.4$. Those who are not familiar with the above rule can use the steel square. Set your rule from 3 in. on one leg to 4.5 on the other and the result will be the same, namely 5.4. In either case divide 5.4 by 4.5 the length of the base and obtain 1.2 the desired factor for finding the true length of any common bar in any type of skylight having one-third pitch.

Knowing the width of the skylight to be 3 ft. 6 in. divide this by two and obtain 1 ft. 9 in. or 21 inches. Multiply 21 by the factor 1.2 and obtain 25.2 the length of the bar from *r* to *O* in Fig. 8. To this amount add the projection *r* to *f* at the top and *O* to *A* at the bottom, both amounting to 1.5 in. Then allow about 1.25 for laps. 25.20 + 1.50 + 1.25 = 27.95 or say 28 inches. It is always customary to allow 3 in. over the computed length of bar, as this projection is unknown when estimate is being made. We then have 5.75 × 28 = 161 sq. in. As there are seven full bars and two half bars then 8 × 161 = 1288 square inches.

The girth of the curb on the narrow side of the skylight we know to be 4.5 inches as is also shown from *j* to *W* in Fig. 10. The length of the narrow side is 42 inches 4.5 × 42 = 189 × 2 = 378 square inches for both ends. The end gable cheek requires a surface of 42 + 3 in. laps equal 45 × 15½ = 697.5 × 2 = 1395 sq. in. for both ends.

The total amount of material follows:

Both curbs on long side	1120 sq. in.
Ridge bar	1288 sq. in.
Common bars	1288 sq. in.
Both curbs on narrow side	378 sq. in.
Gable surface both ends	1395 sq. in.
Bar cleat 36x½"x3"	54 sq. in.
A total of	5523 sq. in.

$$\frac{5523}{144} = 38.5 \text{ square feet.}$$

If 16 oz. cold rolled copper is used to fabricate the skylight 38.5 lbs. will be required. If number 22-gauge galvanized iron is used which weighs 1.25 lb. to the square foot, then 1.25 × 38.5 = 48 lbs.

Stainless Tanks

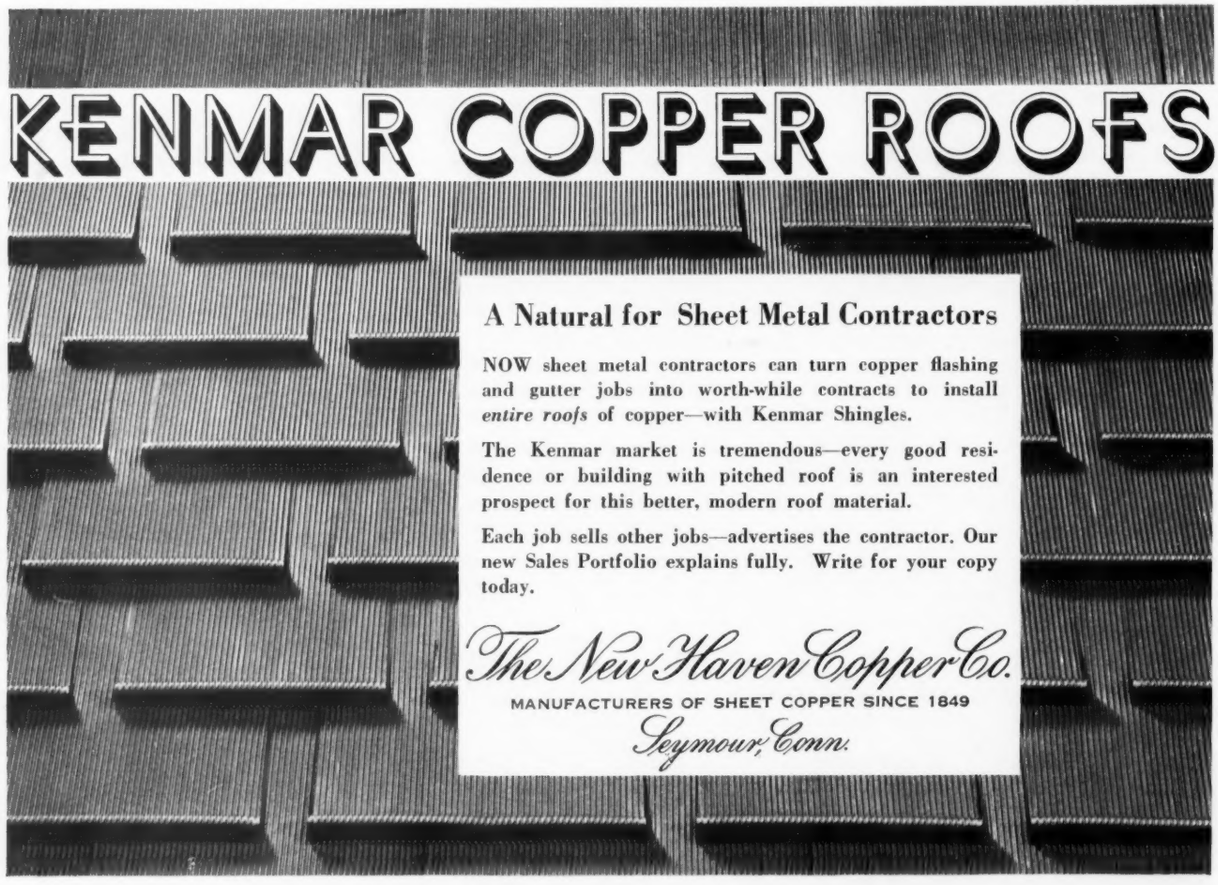
(*Continued from page 79*)

than is recommended for working on ordinary carbon steel sheet of the same thickness was used for this work. The oxygen and acetylene pressures recommended by the manufacturer of the welding equipment were used.

When the pieces of sheet metal were tack-welded and ready for the next step in assembly, ¼- and ⅜-in. thick asbestos sheets were laid along the surfaces that would be exposed most to the welding flame and then thoroughly soaked with water. The asbestos was fitted closely into the corner of the edges to be welded. This was found to be a splendid method of practically eliminating possible difficulties from warping of the sheets.

Strips of the base metal were used as welding rod when this was required, although not much was needed, as the welding operation consisted simply of melting down about ⅛ in. of the adjacent flanges. This is regular recommended prac-

(*Continued on page 88*)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NOW sheet metal contractors can turn copper flashing and gutter jobs into worth-while contracts to install *entire roofs* of copper—with Kenmar Shingles.
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Seymour, Conn.

News Items . . . . . .

Heating, Ventilating and Air Conditioning Courses

The Polytechnic Institute of Brooklyn, New York, will offer evening courses in heating, ventilating and air conditioning during the regular 1936-1937 school sessions, according to an announcement by Professor E. F. Church, Jr., head of the department of mechanical engineering. Registration for the first session in heating and ventilating will be during the week of September 18, 1936. This course covers the calculations and design for heating and ventilating systems, including heat loss computations, boilers, piping, radiation, fans, air duct design, washers, humidifiers and auxiliary apparatus. Problems will be given illustrating the application of various systems to residences, apartments, office buildings, schools, factories and theaters.

Beginning in February, 1937, the course in Air Conditioning will deal with advanced considerations in the field of the previous course, and will present fundamental scientific principles and their application to cooling, humidifying and dehumidifying of air. Steam-air mixtures and psychrometric principles related to comfort cooling and commercial air conditioning will be studied. Also in connection with design of systems, the sessions will cover the theory of refrigeration, cooling load computations, surface cooling, by-pass and local recirculation, spray apparatus, chemical dehumidification methods and automatic controls.

◆

Must Remove Awnings

The City Commission of Brownsville, Tenn., passed on third reading an ordinance requiring the removal of all sheet iron awnings supported by posts or otherwise on the Public Square. Sixty days is given owners to remove these awnings. The city has lately installed a Great White Way system on the square. Removal of old awnings will bring additional attractiveness it is thought.

◆

Firm Advertises on Radio

Memphis Fence and Roofing Co., Memphis, Tenn., Julian Fulenwider, general manager, with factory and warehouse at 40 West Virginia Ave. is showing a very complete line of copper shingles, paints, roofing and fencing materials. The firm with a shop and large staff staged radio programs in the 1936 season. Recently some nice contracts were filled in the city of Tupelo, Miss. in restoration of property damage in the April tornado.

◆

Death of Charles A. Irwin

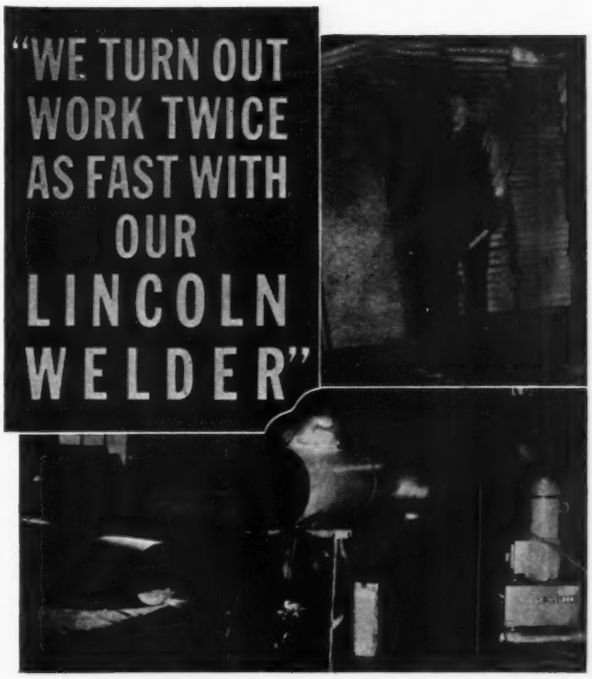
Charles A. Irwin, for many years active in the sheet industry, died at Canton, Ohio, June 2nd, at the age of 63 years. Mr. Irwin became associated with American Sheet and Tin Plate Company in Canton in 1893 and later founded the Dennison Rolling Mill Co. In 1900 with his brother and the late E. A. Langenbach, he founded the Stark Rolling Mills, now a unit of Republic Steel Corporation. In 1909, the brothers founded the Canton Sheet Steel Company and in 1921 Mr. Irwin became president of the Milwaukee Rolling Mill Company. He retired from active business about ten years ago.

◆

Insured Mortgage Loans

The Federal Housing Administration, Washington, D. C., reports that during the week ending May 23, the business done by private financial institutions under the modernization credit plan and the insured mortgage system average over two million dollars a day.

The number of modernization and repair notes reported was 6,839 amounting to $3,011,678. This makes a grand total of 1,049,455 notes amounting to $379,319,007.



"—and we've cut our welding costs 50% since installing this sheet metal welder.

"The insulating panels shown here are made of 20-gauge stock. We welded them in half the usual time and made enough profit over the old way to go far toward paying for the new welder.

"The operator is shown welding 14 in. air duct—16-gauge steel. We have done work of this kind using material as light as 24-gauge.

"Our Lincoln welder uses from $7.50 to $10.00 worth of electric power a month which is a small fraction of the cost of the welding materials we formerly used. It's a mighty handy and profitable outfit."

(Signed) *Harry McGivern,* SUPT.
Safety Guard & Mfg. Co., Pittsburgh, Pa.

Costing as little as $200, this new Lincoln welder can be paid for out of profits in a short time. The coupon will bring you complete details. THE LINCOLN ELECTRIC COMPANY, Department EE-283, Cleveland, Ohio. Largest Manufacturers of Arc Welding Equipment in the World.

★ MAIL THIS COUPON TODAY ★

THE LINCOLN ELECTRIC CO., Dept. EE-283, Cleveland, Ohio.

Gentlemen: Please send me full particulars on the new $200 Lincoln Welder. I now weld with electric arc ☐ gas ☐.

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PROTECT YOUR CUSTOMERS

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Only America's fastest selling Damper gives you all these

10 FEATURES

1 Separate nickel-steel coil handle that stays cool.
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3 Special-steel spindle easily pierces any stove pipe.
4 Hump on spindle locks damper in position.
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8 Carton opens at both ends, no shavings or straw muss.
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Beware of counterfeits of "Griswold-American" Dampers. Though a clever imitation, no substitute gives you all of the above 10 features of the genuine "Griswold-American" Damper. Order your "Griswold-American" Damper requirements in all sizes through your legitimate jobbing channels. Your jobber is in position to make immediate deliveries.

GRISWOLD
GRISWOLD AMERICAN
The Original Steel Spindle
REVERSIBLE DAMPER

News Items . . . . . .

Fabricates Farm Equipment

R. Sauter, 371 North Main Street, Memphis, Tenn., has been making metal troughs and metal bins for use on the farms in Shelby county, which at the first of the 1936 season show real progress in acquirements and equipment. Mr. Sauter also does heating and roofing work.

◆

Bulow Celebrates 50 Years Service

Bulow and Son, Poplar Bluff, Missouri, reports it has been active in the heating, sheet metal and plumbing field as contractors for over fifty years. The firm also manufactures cotton gin pipe and fitting.

◆

McDade Gets Large Contract

C. A. McDade and Sons, 1066 Madison Ave., Montgomery, Ala., sheet metal, roofing and furnace contractors were awarded the contract for the repairs and paint work on the entire roof of the Alabama state capitol. They report a good spring season in roofing.

◆

Contractor Enjoys Boom

Longview, Texas has had a phenomenal building season in the first half of 1936, passing the million dollar mark sometime weeks ago. In the sheet metal field here, the H. and C. Metal Works, at 100 South Center St. is very active and has furnished the sheet metal work on some of the largest and newest buildings here, among the number the fine new plant of Longview Daily News; the new suburban fire station, new city hall, Rita theatre, the First Christian church, the McWilliams building, the Methodist Sunday School building and others.

◆

Firm Sells Farm Buyers

C. A. McDade and Sons, Inc., 1066 Madison Ave., Montgomery, Alabama, do a large volume of roofing and sheet metal work throughout central Alabama. They have in recent months installed numerous water tanks, vats and feeding troughs, throughout this agricultural section of the state which abounds in improved farms.

◆

Engineering Service

André Merle Associates, consultants, specializing in the drafting of plans and specifications, engineering, surveys, installation and operation cost analysis of air conditioning, automatic heating, mechanical ventilation and commercial refrigeration installations are now located at 11 East 44th Street, New York.

◆

Study Sheet Metal Layout

Fifteen employes of the Tennessee Copper Co., Copperhill, Tenn., recently completed a three months course of study in mathematics and sheet metal layout. A. M. Jackson, of the high school was supervisor and classes were taught two nights a week by W. R. Dickens, foreman of leadburners.

◆

Coal Company Starts Heating Department

Frank Clive has joined the Frank Coal Co,. Nashville, Tenn., as its chief heating engineer in the warm air furnace department, it was announced by the firm in February. Formerly of Indianapolis, Ind., Mr. Clive is a graduate of the University of Indiana and for a number of years pursued studies in the heating field at Purdue University. The Frank Coal Co., an old firm, recently opened new offices at 1516 Church St., where the warehouse, display rooms, furnace and stoker divisions will be maintained.

Social Security

(*Continued from page 22*)

agencies as the Board may approve;

(2) No compensation shall be payable with respect to any day of unemployment occurring within two years after the first day of the first period with respect to which contributions are required;

(3) All money received in the unemployment fund shall immediately upon such receipt be paid over to the Secretary of the Treasury to the credit of the Unemployment Trust Fund established by section 904;

(4) All money withdrawn from the Unemployment Trust Fund by the State agency shall be used solely in the payment of compensation, exclusive of expenses of administration;

(5) Compensation shall not be denied in such State to any otherwise eligible individual for refusing to accept new work under any of the following conditions: (A) If the position offered is vacant due directly to a strike, lockout, or other labor dispute; (B) if the wages, hours, or other conditions of the work offered are substantially less favorable to the individual than those prevailing for similar work in the locality; (C) if as a condition of being employed the individual would be required to join a company union or to resign from or refrain from joining any bona fide labor organization;

(6) All the rights, privileges, or immunities conferred by such law or acts done pursuant thereto shall exist subject to the power of the legislature to amend or repeal such law at any time.

The Board shall, upon approving such law, notify the Governor of the State of its approval."

Employee Requirements

Concerning the benefits to accrue to the unemployed "covered" employees, there is, in the section quoted in (2) above, the requirement that no compensation shall be payable with respect to any day of unemployment occurring within two years after the first day of the first period with respect to which contributions are required. For further education on what may be expected by employees in the future, the published statements of the Federal Social Security Board are quite illuminating.

In the Summary of the Provisions of the Act relating to Unemployment, released by the Board, appears the following:

"Unemployment compensation is not, as sometimes supposed, a system under which every unemployed person is entitled to receive benefits for any and all unemployed time. Unemployment compensation plans ordinarily provide that benefits can be paid only in proportion to the length of time that the employee has previously been employed (USUALLY ONE WEEK OF BENEFIT TO FOUR WEEKS OF EMPLOYMENT), and usually provide a maximum number of weeks during the year which an employee may receive benefits (USUALLY FROM TEN TO SIXTEEN WEEKS). Obviously it is designed to provide protection primarily for the stead-

STOP FURNACE LEAKS and INCREASE PROFITS
WITH
NU-DRY FURNACE CEMENT

Because . . . .

It comes to you in dry form, takes less material to set a furnace, DOES NOT CRACK, POWDER OR BLOAT WHEN FURNACE IS FIRED IMMEDIATELY AFTER APPLIED, will not shrink, keeps joints tight at all times, stands high temperatures, is not affected by temperature changes. There is no loss because it does not get hard in containers, and requires only five and one-half pounds where you ordinarily use ten pounds of plastic.

The following jobs and furnace manufacturers use and stock Nu-Dry Furnace Cement. Ask them about it.

Akron, Ohio
XXth Century Heating and Ventilating Co.

Buffalo, N. Y.
J. M. and L. A. Osborn Co.

Cleveland, Ohio
Forest City Foundries Co.
Henry Furnace & Foundry Co.
J. Kinsner and Son Co.
Ohio Sanitary Specialty Co.
J. M. and L. A. Osborn Co.

Cincinnati, Ohio
Cincinnati Stamping Co.
The Huenefeld Co.

Columbus, Ohio
Vorys Bros., Inc.
Munkle Heating Co.

Dayton, Ohio
Direct Plumbing Supply Co.

Detroit, Michigan
Detroit Safety Furnace Pipe Co.
Ideal Furnace Co.
J. M. & L. A. Osborn Co.

Fort Wayne, Ind.
Wayne Pattern and Foundry Co.

Grand Rapids, Mich.
Behler and Young Co.
W. C. Hopson and Co.

Philadelphia, Pa.
Adelta Stove and Mfg. Co.

Pittsburgh, Pa.
Demmler Bros. Co.
Heating Supply Co.
Henry Furnace and Foundry Co.
A. H. Johnson Co.

Peoria, Ill.
F. Meyer and Bros. Co.

St. Louis, Mo.
A. G. Brauer Supply Co.
Hammond Sheet Metal Co.

Toledo, Ohio
C. F. Throm and Sons

THE PYROLITE PRODUCTS COMPANY
1221-31 W. 74TH ST., CLEVELAND, O.

ily employed person and can take care of the seasonal or unsteady employee only for very limited periods of time.

"It is very important that these limitations be clearly understood."

It is not believed that the Federal Social Security Board has given very wide publicity to this phase of the Act—that "unemployment compensation is not . . . a system under which every unemployed person is entitled to receive benefits for any and all unemployed time." It, then, becomes the duty of all thinking citizens, employers and employees alike, to see that this phase of the so-called Federal Social Security Act is generally understood. It is most assuredly a bad policy to mislead or deceive the employees or to allow them to think that this Federal Act will provide unemployment compensation benefits for all unemployed time. It is necessary, therefore, that a campaign of education be undertaken, with the purpose of spreading clear and truthful information about this most important subject—to both employers and employees. It affects both, and like all other matters the interests of employer and employee are so closely intertwined that they cannot be completely separated.

Notwithstanding the fact that Titles III and IX of the Federal Social Security Act do not provide benefits for the unemployed, there still remains the bold bare fact that, as employers, there is now accruing, and has been since January 1, 1936, a tax of one per cent on the pay rolls of employers of eight or more (as defined in section 907). In 1937 this tax rises to two per cent; and for 1938 and thereafter the rate shall be three per cent.

Labor represents a very substantial part of the cost of the work done by sheet metal contractors and, while one per cent may appear small, it is not based on profit—it is levied directly on wages paid—and may actually be the difference between a profit and a loss. In a later article, the relation of a pay roll tax to costs will be discussed. In the next article it is proposed to discuss the several State Acts which have already been enacted and, in any consideration of costs, both Federal and State pay roll taxes must be considered.

Stainless Tanks

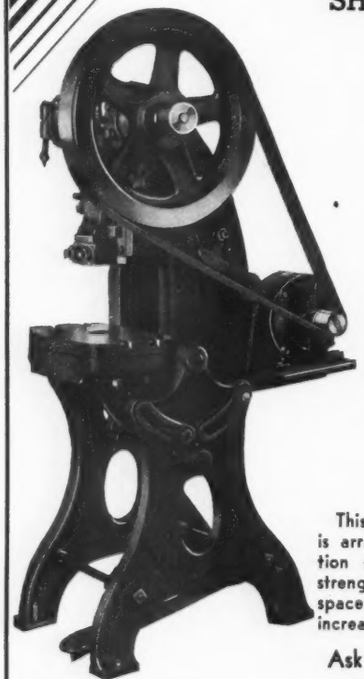
(*Continued from page* 84)

tice for the making of flange type joints in sheet metal of this thickness. In this case, however, it will be remembered that rather wide flanges were turned up in order to leave the reinforcement in the finished tank that this type of preparation would give. The strips of metal used as welding rod served a dual purpose in that they were used to assist the action of the flux by scraping off the viscous oxide slag that formed on the surface of the molten puddle. This particular type of stainless steel does not flow as easily under the action of the welding flame as some other types do, although the welding quality is good.

When the welding work had been completed, the heat color marks were readily and permanently removed by the application of a regular type of mechanic's hand cleaner and common household scouring powder.

The **MARSHALLTOWN** *Line*

PRESSES—Capacities from 10 ton to 70 ton.
SHEARS—Capacities 18 gauge to ½" plate.



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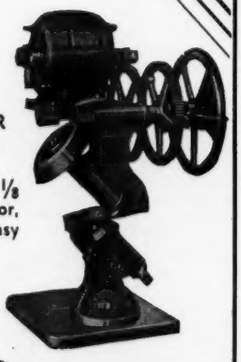
THROAT SHEAR
Is especially designed for Cutting Inside Circles and Irregular Shapes.



No. 18
MOTOR POWER THROATLESS SHEAR
Complete with ⅛ HP standard motor, self-feeding and easy to operate.

No. 2
PRESS
This ruggedly constructed Press is arranged with proper distribution of weight giving maximum strength and affording ample die space, low operating cost and increased output.

No. 18
HAND POWER THROATLESS SHEAR
For irregular cutting or straight splitting of 18 gauge sheets or lighter. Will cut sheets of any dimensions.

Ask Your Jobber or Write

Marshalltown Manufacturing Co.
MARSHALLTOWN IOWA

MARSHALLTOWN IOWA, U.S.A. MFG. CO.

With the Manufacturers . . .

Firestone, Round Oak, Honored by Masons

James F. Firestone, general manager of the Round Oak Co., Dowagiac, Michigan, was made Most Excellent Grand High Priest of the Royal Arch Masons of Michigan in May.

◆

Inland Establishes Chicago District Sales Office

Inland Steel Company, Chicago, announces the establishment of a Chicago District Sales Office with Leon C. Reed as District Sales Manager and Otto G. Neumann as Assistant.

◆

Grant Wilson Represents Johnson

Grant Wilson, Inc., 4101 West Taylor Street, Chicago, Illinois, has been selected to represent sales interests in this territory, according to an announcement by Johnson's Company, Thetford Mines, Quebec, Canada—the oldest miners and producers of high grade asbestos fibres.

◆

Ruby Line Repackaged

The Ruby Chemical Company, 74 McDowell St., Columbus, Ohio, has repackaged its entire line of soldering products in new, modernistic containers. These newly designed containers give the Ruby line a family resemblance.

◆

Grahame Joins Fox

Fred Grahame, St. Paul, Minnesota, well known to many of the warm air furnace and air conditioning men in the Northwest, has been appointed to the sales staff of the Fox Furnace Company.

◆

New Service and Merchandising Suggestions

International Heater Company, Utica, New York, is offering a new service—figure the job, make a working plan, and fabricate the duct work, at a quoted price, thus assuring the contractors of a guaranteed material cost including duct work and fittings, without figuring the heating requirements of each individual room. All they ask is that the contractor select the proper size of air conditioning unit, based on total heat loss, select the number of warm air outlets and cold air inlets for each floor (disregarding size), check the number and multiply by the standard price, resulting in the cost of the duct work, dampers, registers and faces.

The company also provides a sheet of seventeen merchandising suggestions.

◆

"Three and a Half Millionths of An Inch"

Parker-Kalon Corporation, 190 Varick St., New York City, manufacturers of sheet metal screws, is using apparatus to measure down to three-and-a-half millionths of an inch to make the master gage blocks from which are made their master gages. The company claims to have the only machine in the world to make such fine measurements, that they actually make these master gage blocks to measurements of two millionths of an inch, and the surfaces are so perfect that it takes a pull of 300 pounds to separate them when two flat sides are placed against each other.

The company has just opened a new laboratory in which the investment in equipment and patterns represents close to half a million dollars. They have an engraving machine with which they can engrave the Lord's Prayer on the head of a pin, and their shaping and forming equipment in this laboratory is the finest that can be secured. As a consequence, each sheet metal screw is as exactly like the other millions of screws made as human ingenuity can accomplish.

LOOK . . .

- BEAUTY
- EFFICIENCY
- QUALITY
- STRENGTH
- PRICE

. . . . . and that's not all! Into every RYBOLT Cast-iron Furnace goes the knowledge and experience gained in over 26 years of furnace building. When you install a RYBOLT Cast-iron Furnace you are certain that it will more than back up everything said and expected of it. Such outstanding features as Duplex ball bearing grates, radically improved feed section, one-piece radiator, waist high shaker, and new beauty of design are features which prove RYBOLT'S leadership.

Last winter's terrific cold spells wore out many a furnace and replacements will be needed before the coming cold weather. Why not go after those jobs now? Cinch every installation and supply your customers with clean, trouble-free heat for years to come by specifying and installing RYBOLT Cast-iron Furnaces.

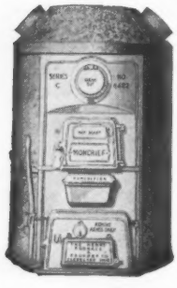
Write today for literature. No obligation, it's free.

RYBOLT HEATER CO.
ASHLAND OHIO

NEW PROFITS from Old Homes

● **Home owners have money this year. What a chance to sell them the new furnace they have needed for years . . . to improve comfort with an air conditioning system . . . to add air conditioning equipment to their furnaces.**

The Moncrief Special Finance Plan makes it easy to get business. It offers the most liberal terms . . . is the simplest to operate. No down payment . . . three years to pay if desired.



Moncrief supplies everything you need to sell everybody . . . Furnaces, cast and steel . . . Air Conditioning Systems for gas, coal or oil . . . a full line of pipe and fittings.

Write for particulars

The Henry Furnace & Foundry Co.
3473 E. 49th St. Cleveland, O.
Manufacturers of

MONCRIEF FURNACES and Air Conditioning Systems

With the Manufacturers . . .

Friez 60th Anniversary

Julien P. Friez & Sons, Inc., 4 No. Central Avenue, Baltimore, Maryland, celebrated its 60th anniversary on June 1, 1936. The Company was founded in 1876 by Julien P. Friez, and its manufacturing activities have been located in Baltimore, Maryland throughout its history.

◆

Fabricators Buying Machinery

The manufacturing and contracting ends of the air conditioning industry are playing an important part in the general increase in machinery sales, according to George R. Kinney, sales manager of the Niagara Machine and Tool Works, manufacturers of presses, shears and machines for plate and sheet metal work.

◆

Inland Purchases Milcor

Milcor Steel Company, Milwaukee, Wisconsin, became a completely-owned subsidiary of Inland Steel Company, Chicago, effective July 1, 1936. All of the outstanding stock of the Milcor Company was purchased by the Inland Company for 59,000 shares of the capital stock of Inland Steel Company.

No changes will be made in management or operations. The present officers will continue to operate the company as a unit, in line with previous practices.

◆

International Dresses Up Chicago Warehouse

The Chicago warehouse and branch office of the International Heater Company has just recently been dressed up by painting large signs on all four sides of the building. A recent street improvement has exposed all four walls which fact was taken advantage of by Manager T. Reid

Mackin. The Chicago office of the company dates back to 1898, under the management of H. H. Kennedy. In 1904, increase in business demanded more space and the building at 1933 Wentworth Avenue was erected and remains the headquarters today. The Chicago office is headquarters for the sales force covering Iowa, Illinois, Indiana, part of Michigan, part of Ohio, and the Chicago area.

◆

Barber Gas Burner Co. of Michigan

Announcement is made of the incorporation of The Barber Gas Burner Company of Michigan. Harry E. Kerr is president and Edwin Booth, secretary. The Michigan Corporation is a subsidiary of The Barber Gas Burner Company of Cleveland, Ohio. Sales office, Assembling and Service Plant, and Warehouse are located at 4475 Cass Avenue, Detroit, Michigan, and the new company will actively cultivate gas conversion burner business in Michigan and Western Ontario, Canada.

Attic Ventilation

(*Continued from page* 80)

pacity. One-fifth of 322,560 cubic feet per hour equals 64,512 cubic feet of air per hour per unit. Inasmuch as this roof space is shallow and the distances for air travel are great, it will be necessary to use fans. Each fan ventilator must have a capacity of at least 65,000 c.f.m.

The other roof is somewhat smaller, namely 48x66 feet totaling 3,168 square feet of roof space. Multiplying this by 80 gives us 253,440 cubic feet per hour as our necessary air turnover.

This roof pitches four ways, from each wall toward the center. We can use the present hatch for an intake and it will be sufficient if it totals 6 square feet in area. Otherwise an additional hatch should be put in approximately under the center of the roof.

The additional hatch would be located toward the north end of this attic, rather than at the extreme south end because the exhausts are all to the north. If it were put at the north, it would have a tendency to leave the south end dead.

Fan Locations

An exhausting unit at the center of each of the outside walls, namely the north, east and west, and as close to the high point as possible, will give ideal distribution. It may be desirable for appearance sake, to use the same unit for this roof as for the other, and the capacity of the three exhausters should be at least 254,000 cubic feet per hour. This attic is over north apartments, whose walls are not so exposed to the sun as are the south apartments. The 8-inch ventilators should be closed. The air from the hatch will have a tendency to circulate around the walls, which will eliminate dead air pockets at the southeast and southwest corners of the roof space.

Operation

Fans should be turned on immediately after sundown and left on for several hours, depending on how extreme the heat is. Best results will be obtained by leaving the fans run until four or five o'clock the next morning. Or, they should be shut off as soon as the outside air reaches a temperature higher than the air inside of the apartment. They should be left off all day, because the air inside of the apartment will be cooler than the outside air. As soon as the outside air becomes cooler than the air inside of the apartment, the fans should be turned on.

You are correct in thinking that insulation without ventilation will not be satisfactory. It is necessary to get rid of the accumulating heat, and that can only be done by ventilation. Insulation added to ventilation, makes an ideal arrangement.

HOW TO SELL FURNACES and REPAIRS

The only proved, positive and sure way to sell furnaces and repairs is to sell first

TORNADO Furnace Cleaning Service

Furnace cleaning is easy to sell because it pays for itself many times over through fuel savings. Besides the profit you make on the cleaning job itself, you have still greater opportunity because you get into the basement where it is easy to convince the owner that he needs a new furnace or repairs.

Hundreds of dealers are now building business with the TORNADO—the most powerful and complete furnace and boiler cleaner built. Leads the field! Low price—easy payments! Write for complete information on a real money-maker!

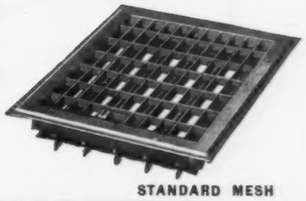
BREUER ELECTRIC MFG. CO.
865 Blackhawk St., Chicago, Ill.

BREUER'S BALL BEARING TORNADO Furnace Vacuum Cleaner

INDEPENDENT

"Fabrikated"

- STRENGTH and RIGIDITY
- MAXIMUM OPEN AREA
- MODERN DESIGN
- BETTER FINISHES



STANDARD MESH

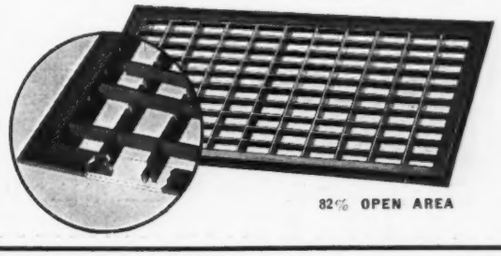
FLOOR REGISTERS and COLD AIR FACES

Independent "Fabrikated" gives maximum air delivery against low resistance with a minimum of area required for the cold air face or register. From the full line of sizes and finishes you can always find the register or face that best suits your need.

Send for Catalog and Data Book

The INDEPENDENT REGISTER Co.

3741 E. 93d Street • Cleveland, Ohio



82% OPEN AREA

Sound Stage Noise Elimination

(*Continued from page* 14)

fan rooms, louvre vents are fabricated of 16 ga. galvanized iron covered with 1-inch galvanized iron mesh.

"Formerly, duct systems in sound stages were located in the ceiling. This necessitated thousands of feet of catwalk for their inspection and servicing. Moreover, when lofty 'props' or 'sets' were being erected on the floor below, the ducts sometimes got in the way. If the masts of a cup challenger fouled the metal, the ducts would be cut away to accommodate the towering spars. On such occasions, the set was deprived of all air conditioning, while the constant ripping out and patching here and there played the devil with the installation. After about one year the whole works had to be scrapped," Architect Anderson testified.

To overcome these objections, Columbia's experts decided to locate their duct system on the roof, making it accessible at any point. It was necessary to bridge it only at a few strategical points, using light frame overpasses.

The ducts were specified large—to reduce noise conduction. Tested with instrument for delivery, all ducts pull at the same velocity. At the exhaust traps, which are well daubed with plastic cement, the insulation is carried back about five feet into the system.

All mineral wool sound-absorbing is applied to the metal with glue.

At the dampers, "Linodex" is used. The dampers are of 18 gauge G. I. and are of the adjustable quadrant locking type. Each damper is well stiffened and braced, and insulated with rock wool.

The same insulative agent is used to cover the sound stages. Over all walls and ceilings of the inside of the building there is a one-inch application of this blanket, secured by hog wire. Outside, the wool is applied under the plaster to a depth of four inches.

Supplementing these precautions, canvas joints are liberally spotted throughout the system—at the point where the twin buildings adjoin, in the fan room between blower and wall and between the fan and the ductwork, etc.

Speaking of the work generally, Mr. Anderson said:

"Our combination of heating and ventilating promises to be most satisfactory. On crisp mornings, we turn on the heating units about six o'clock, and we find that when the shooting companies arrive at about 8:30 or so, all the chill has been taken off the air.

"Mr. McCluney, the contractor, guaranteed that no noise would be audible through the exhaust ducts outside the fan room or from the exhaust grilles—at a distance of five feet from the openings. This rather stiff requirement, I am happy to say, has been strictly lived up to. There is absolutely no rattling or drumming. The fabric joints, baffles and sound-absorbing wall lining of the sheet metal cut off a speaker's voice at a distance of five feet. We measured it. For our comparatively modest appropriation we feel we got the best possible job."

PERFORATED METALS

Every Sheet Metal Worker needs perforated metal in one form or another.

For processing food products and to withstand certain chemicals, perforated Stainless Steel and Monel Metal are much used.

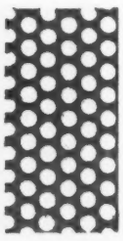
Factory Safety Guards—For this service perforated metal has no equal.

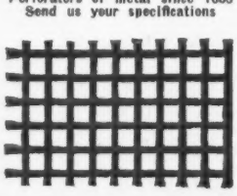
For Grilles, Radiator Enclosures, Air Conditioning Cabinets, we have many beautiful designs.

Write today for information and prices.

You'll like H&K prompt, satisfying work and pleasing prices.

Perforators of metal since 1883
Send us your specifications





The Harrington & King PERFORATING Co.

5649 Filmore St., Chicago, Ill. New York Office, 114 Liberty St.

FURNACE MEN! ATTENTION!

There are plenty of homeowners thinking about furnaces for the coming winter. Last year's cold winter took the dying gasp from many an old furnace, and the people want real value and assurance of heating satisfaction when they invest their money in a new heating plant. That's what Favorite gives them.

It will pay you to acquaint yourself with the many points in favor of the Hermetic Favorite Furnace. Investigate its fine modern construction, proved fuel economy and excellent dealer proposition and then go after those potential sales.

It won't take long to get them. Show them why the Hermetic Favorite is far superior and they're sold. Don't delay. Write for free literature now!

Repair parts furnished for all Hermetic and Favorite Furnaces, also for any model Favorite Gas, Cook or Heating stove.

WE GUARANTEE FAVORITE STOVES AND RANGES "BEST IN THE WORLD"

FAVORITE MFG. CO.
PIQUA OHIO

With the Manufacturers . .

Gowing to Distribute Hobart Welders

The Hobart Brothers Company, Troy, Ohio, announces J. C. Gowing Welding Equipment and Supply Company, has been appointed exclusive distributor for Hobart Electric Arc Welders in Southern California. The firm is one of the oldest and best known welding pioneers in California. Their new location at corner of Laura and Regent, Huntington Park, will offer a complete line of Hobart Simplified Arc Welders and supplies.

◆

Lincoln Moves Pittsburgh Office

The Lincoln Electric Company, Cleveland, Ohio, announces the moving of its Pittsburgh office, formerly at 323 Fourth Ave., to larger quarters at 926 Manchester Blvd.

Personnel includes: F. M. Maichle, District Manager: W. R. Persons and H. E. White, Sales Engineers, and Miss Esther Lee, in charge of the Order Department.

◆

Century-Penn Meetings Draw Dealers

Century Engineering Corporation, Cedar Rapids, Iowa, and Penn Electric Switch Co., Des Moines, Iowa, have just concluded a well-attended series of sales and service meetings held in Atlantic seaboard oil burner markets in cooperation with Century burner distributors.

Distributors who cooperated in this series of meetings were: C. A. Leander, Worcester, Mass.; C. E. McGregor, Automatic Heating Co., Troy, N. Y.; H. E. King, Delaware Plumbing Supply Co., Wilmington, Del.; T. E. Byrnes, Inc, Hartford, Conn., and George Kelly, Century Products Co., New York City.

Meetings were held at Lewiston, Maine; Bellows Falls, Vermont; Worcester, Mass.; Hartford, Conn.; Troy, New York and Wilmington, Delaware.

◆

Stark County, Ohio, Dealers' Meeting

The dealers of Stark County, Canton, Ohio, enjoyed a banquet on April 27th, and held one of the most successful meetings of the season. Sixty-six were in attendance—82 per cent of the dealers in the county.

The meeting was sponsored by Grant Totten, Inc., local jobber of Moncrief line.

H. S. Sharp, vice president of the Henry Company, pointed out the great opportunity that air conditioning is giving furnace men and emphasized the obligation that it places on the dealers. He pointed out that the air conditioning business grew out of the furnace business and logically belongs to the furnace man.

Herbert F. Curtis, air conditioning engineer, speaking on the technical side of air conditioning told the dealers of the necessity for mastering air conditioning and the need for familiarity with the mechanical code.

Homer Cunningham of the sales department of the Henry Company, asked dealers to cooperate as closely with the engineering department as they ask the engineering departments to work with them. He advocated more constructive selling.

To be "Right" every furnace must have a refractory lining.

FIRELINE

Modernize every furnace you install or overhaul with FIRELINE. Put in in less than an hour, in any make or type furnace, FIRELINE "sets" into a 1-piece refractory lining that raises combustion temperatures—eliminates smoke, soot and gas (burns it) and reduces ashes to *ashes* (ends ash sifting).

Plastic, easily applied, it goes over new or burned out firepots making them gas tight—protecting them indefinitely. Fully guaranteed—it brings industrial efficiency to domestic heating plants, increases the heat producing capacity of any plant, of every fuel—cuts coal bills proportionately and *increases your profit on every job.*

Repairs **CRACKED FIREPOTS** without new castings. Protects new firepots indefinitely against burning out.

Furnace men reported extra profits of $1,280; $1,100; $890, etc., etc., in a few months (see last month's ad). You can do as well or better. Start Now.

Write for all data, sales helps and FREE SAMPLE

Fireline Stove & Furnace Lining Co.
1866-H Kingsbury St., Chicago, U.S.A.

(Copr. 1936, Plibrico Jointless Firebrick Co.)

START IN THE BASEMENT WITH A SUPER AND CLEAN UP

Watch the money roll in when you do furnace-cleaning jobs with the high-speed low-upkeep Super Red Streak Cleaner.

Repairs and replacements must be made before fall. You will uncover profitable jobs cleaning that you would never see in any other way.

----------USE THIS COUPON----------

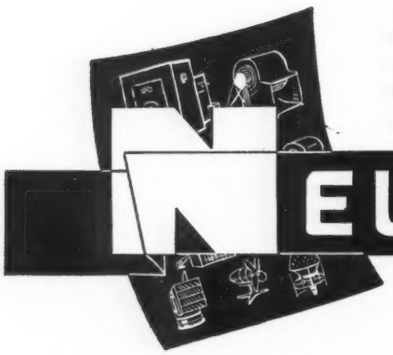
The National Super Service Co.
1944 North 13th St., Toledo, Ohio

Send your Plan Book without cost and tell me about your free trial plan on THE NEW HIGH-QUALITY LOW-PRICED RED STREAK CLEANER.

Name .....

Street address .....

City and State .....



For your convenience a number has been assigned each item. Check the items in which you are interested on the coupon on page 100 and mail to us. Complete information will be forwarded.

● Indicates product not listed in 1936 Directory

△ Indicates product and manufacturer not listed in 1936 Directory

NEW PRODUCTS

75—Armco Stabilized Steel

The American Rolling Mill Company, Middletown, Ohio, announces full commercial production of "Armco Stabilized Steel" in cold rolled sheets and strip.

Stabilized steel is offered by the company as a uniform, deep-drawing and non-aging cold rolled steel with all stretcher strain permanently eliminated in the tempered condition. It retains indefinitely, they say, all of the properties of temper-rolled steel, making pre-fabrication treatments unnecessary, regardless of the length of time the metal has been in stock.

◆

76—Trane Redesigns Conditioner

The Climate Changer, manufactured by the Trane Company, LaCrosse, Wisconsin, has been redesigned to present a more efficient and compact year round air conditioner for residences and small buildings.

A new target type humidifier, which they say completely eliminates the difficulties of clogging spray nozzles

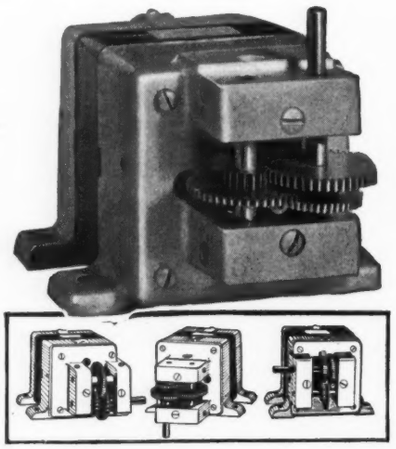
and coated cascade trays, has been added. A fine stream of water at a high velocity is directed against a specially designed target where the force with which it strikes serves to spread it in a fine mist throughout the humidifier chamber.

A half inch layer of insulation lines the bottom of the unit where cold condensation water is drained from the dehumidifying coils preventing sweating. Special arrangements permit easy access to the interior of the unit.

A lighter, but sturdy base facilitates installation. The motor was moved to an individual mounting on the side of the unit where it is easily serviced.

The general cycle of operation that provides winter heating, humidifying and filtering, and summer cooling, dehumidifying and filtering remains the same.

◆



77—Flea Power Motor

The Speedway Manufacturing Company, Cicero, Illinois, manufacturers SpeedWay electric tools and motors, announce a new "flea power" worm drive, back-geared motor that comes not only in A. C., D. C. and Universal, but at the same time can be assembled with drive shaft to right, to left, up or down. This new feature, it is claimed, greatly simplifies mounting problems and will eliminate the need for complex and angular drives.

◆

78—New Electric Drill

The Stanley Rule & Level Plant, New Britain, Connecticut, announces a new electric drill, Victor No. 114, light in weight, and compact in size.

The Stanley Victor measures 12 in. in length and weighs 5¼ pounds. It has a capacity up to ¼ in. in steel and has a Universal type motor, operating on either D. C. or A. C. current, 60 cycles or less. It has a heavy duty, three-jaw chuck. It operates at a load speed of 1400 r. p. m. The motor housing and handle are cast in one piece from a strong aluminum alloy. It is equipped with a rocker motion switch, conveniently located in the handle. It fits in a tool kit and is designed especially for service jobs by plumbers, garage mechanics, electricians, carpenters, installers of oil burners and air conditioning equipment.

◆

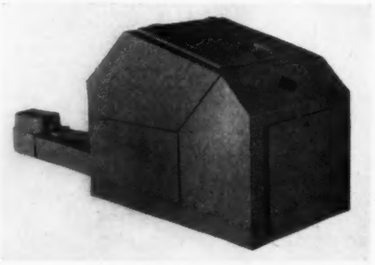
79—Automatic Coal Stoker

The Will-Burt Company, Orrville, Ohio, announces two small capacity coal stokers.

The small unit is built in two capacities—the No. 15 with a small burner pot especially for hot water supply systems, and the No. 30 developed for heating systems in small and moderate sized buildings.

The hoppers, made from heavy copper bearing steel, each hold 350 pounds of coal. Lids are sealed with rubber. Ventilating tube connects hopper and fan intake to remove moisture. Hopper base, made of heavy cast iron, is provided with outside cleanout port.

The power unit is of the continuous feed type. Worm, worm gear and spur gears are made from bronze and drop forgings. All working parts op-



erate in a bath of oil. Exposed shear pin, that does not require tools to replace, is standard equipment.

Three coal feeds are provided on each unit to cover the full range of feeding capacity. Motor is mounted on rubber and spring for quiet operation and automatic belt tension. Automatic Air Control provides the right amount of air to the amount of fuel being burned under changing fuel bed conditions. Fire pot is rectangular and sectional type.

Automatic switch provides for lighting a light or ringing a bell in the event of a sheared pin. Overload Relay protects motor against ordinary overloads.

Coal feed screws are made from steel, and in one piece. Coal feed tubes are heavy steel tubing.

"370 SPECIAL"

TINNER'S RED OXIDE ROOF PAINT

The Standard of Quality

Sold only through recognized Sheet Metal Jobbers

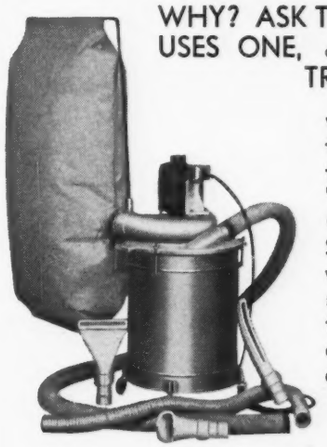
Lyon, Conklin & Co., Inc., Baltimore & Washington
Stichter Hardware Co., Reading, Pa.
The J. M. & L. A. Osborn Co., Cleveland, Detroit, Buffalo
Rockford Sheet Steel Co., Rockford, Ill.
Arnold Supply Co., Birmingham, Ala.
Herr & Co., Lancaster, Pa.
Follansbee Brothers Co., Pittsburgh, Pa., Rochester, N. Y.
Eagle Roofing and Art Metal Works, Tampa, Fla.
The Moise Steel Co. of Ohio, Cincinnati, O.
Vorys Brothers, Inc., Columbus, O.
McClure-Johnston Co., Pittsburgh, Pa.
Demmler Bros. Co., Pittsburgh, Pa.
W. F. Angermeyer & Co., Pittsburgh, Pa.
F. D. Mitchell, Albany, N. Y.

Manufactured by

THOMPSON & COMPANY
Since 1847
P. O. BOX 6757 PITTSBURGH, PA.

The One Man Deluxe Portable Grand Rapids Furnace Cleaner

THE CHOICE OF HEATING MEN EVERYWHERE



WHY? ASK THE MAN WHO USES ONE, and OUR FREE TRIAL with no strings attached—allows you to see for yourself. "A PLAN TO INCREASE YOUR SALES" which goes with the machine is not an arm-chair theory but the outcome of successful experience.

CONVENIENT TERMS

OUR ATTRACTIVE LOW PRICE GIVES YOU MORE FOR YOUR MONEY

Write for details.

GRAND RAPIDS FURNACE CLEANER COMPANY
Grand Rapids, Michigan

WHITNEY LEVER PUNCHES

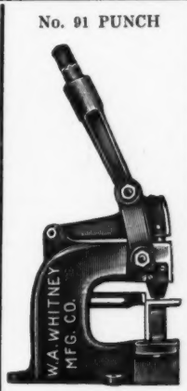
No. 4B PUNCH

Length—8½ inches. Capacity ¼-inch through 16 gauge. Deep Throat—2 inches. Weight—3 pounds. Punches and Dies—$\frac{1}{16}$" to $\frac{25}{64}$" by 64ths.

No. 6 PUNCH

Length — 26½ inches. Capacity — ¼-inch hole through $\frac{1}{16}$-inch iron; especially adapted for button punching or templet work. Punches and dies $\frac{1}{16}$" to $\frac{25}{64}$" by 32nds.

No. 91 PUNCH

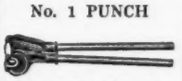


Capacity — $\frac{25}{64}$-inch hole through ¼-inch, 1-inch hole through $\frac{13}{16}$-inch and 2-inch hole through ⅛-inch iron. Depth throat 5-inches. Weight—82 lbs.

We have tools for every purpose needed by Sheet Metal Contractors.

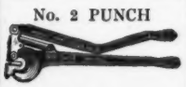
Ask your Jobber

No. 1 PUNCH



Length — 34 inches. Capacity — $\frac{25}{64}$-inch hole through ¼-inch iron. Punches and dies in sizes from $\frac{1}{16}$ to $\frac{25}{64}$ by 64ths.

No. 2 PUNCH

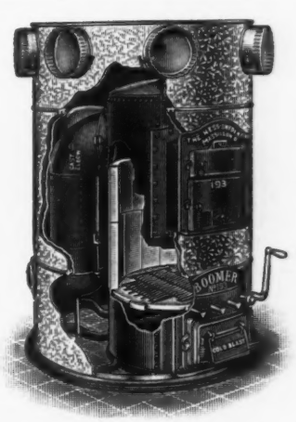


Length — 23 inches. Capacity — $\frac{13}{16}$-inch hole through ¼-inch iron. Punches and dies in sizes $\frac{13}{16}$-inch to ½-inch by 64ths.

CHANNEL IRON PUNCH

Companion to No. 2 Punch. Every part of the two Punches Interchangeable, including punches and dies. Capacity—¼-inch hole through ¼-inch iron.

W. A. WHITNEY MFG. CO.
636 RACE ST. ROCKFORD, ILL.



Boomer Boiler Plate Furnaces

Also made with duplex grates and upright shaker.

Have been successfully made for 23 years. Where introduced have given satisfactory service. The fire pot liners are the best we can buy and we know of several Boomers that still have the original liners in, which are 23 years old. We have been making cast iron Boomers for 50 years.

If you are interested in selling a strictly high grade furnace, ask for prices and agency.

Nothing but the best of material enters into the making of Boomers.

When repairs are needed, avoid risk of dissatisfaction by ordering direct from the original patterns. Prices are low.

We sell to legitimate dealers only.

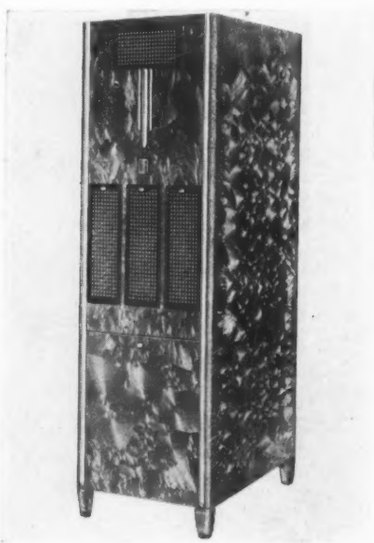
THE HESS-SNYDER CO., MFRS.
Massillon, Ohio

New Products . . . . . .

80—Space Heater

The Mueller Modernaire, L. J. Mueller Furnace Co., 2005 W. Oklahoma Avenue, Milwaukee, is designed for use in stores, shops, showrooms, small factories and similar commercial and industrial applications, where the unit is to be installed in the space to be heated. The unit heats, filters and humidifies the air and distributes it by forced circulation.

Heat transfer units are pressed steel sections. A Mueller air moistener supplies humidity automatically. Climator



fan and motor are located below the heating sections. Return air is drawn at floor level through the filters, is heated and humidified, then discharged through cowl or duct at top of unit. Fan operates automatically when furnace is in operation. Filters are of semi-permanent type.

Modernaire is supplied regularly with casing finished in green prismatic lacquer or it may be supplied in prime coat permitting unit to be finished to match room decoration. Unit is shipped completely assembled. All that is necessary is to connect gas, water, electricity and vent, and attach cowl or duct. All controls, necessary for automatic operation, are supplied.

◆

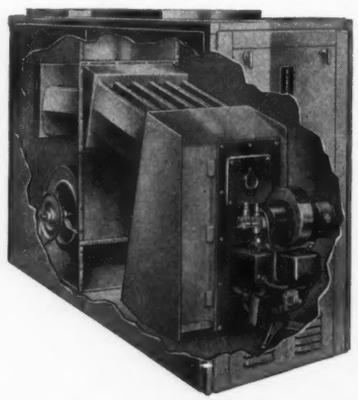
81—Coal Burner

A forced draft coal burner, consisting of a blower, special grate and an inside air cone, to distribute heated air throughout the fuel bed and into the combustion air above the fuel bed to produce a hot blue flame, is announced by the Bignall Company, Medina, New York. The grates are rotary in action and provide a quick shaking and cleaning action. The blower provides the correct amount of air for complete combustion.

82—Five New Models

Electrol Incorporated, 934 Main Avenue, Clifton, New Jersey, is presenting five new models in a twelve-page catalog entitled "Electrol Air Conditioning."

The company suggests conditioning homes step by step where expense is



a consideration. For those who already have automatic furnace heat, there is a blower unit and humidifier (spray type); for the steam or hot water heating plant, a split-system for air conditioning; for new construction, a direct-fired furnace conditioner; a unit room conditioner for one or more rooms where no structural changes are to be made—the unit taking the place of an existing radiator; or the unit room cooler where summer air conditioning only is desired.

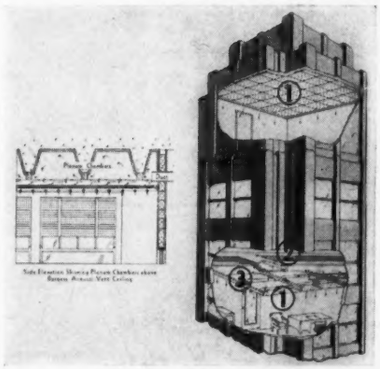
The company manufactures oil burners and complete oil furnaces, and offers a survey and plan and layout service through their dealers.

◆

83—Burgess Acousti-Vent

C. F. Burgess Laboratories, Inc., 111 W. Monroe St., Chicago, has devised a new system of air distribution, said to solve the dual problem of air circulation without drafts, and the quieting of occupational room noises. This new product is being marketed by the Acoustic Division of the Burgess Battery Company, Madison, Wisconsin, as a licensee, under the name of Burgess Acousti-Vent.

The system comprises a perforated ceiling made of a suitable architectural surface installed slightly below the normal ceiling level of the room. Between the perforated sheet and the room ceiling is a sound absorbing material that is installed with sufficient clearance so that a space is provided between this sound absorbing material and the ceiling. This space provides a plenum chamber into which air is introduced through ducts from the ventilating fan. A uniform, low static pressure is maintained in this plenum



chamber and suitable means are provided to cause the air to pass to the underside of the sound absorbing material, without passing through it, and thence through the myriads of small openings in the perforated sub-ceiling into the room. It is claimed that the system makes possible a rapid change of heated or cooled air without drafts. The second major feature is its efficiency as a sound absorbent of room noises and the noises of the ventilating system.

◆

84—Oil Economy Furnace

International Heater Company, Utica, New York, announces the Oil-Economy Furnace, of cast iron, designed for oil exclusively, available for air-conditioning as well as gravity warm air heating.

The furnace will operate with any standard oil burner, the burner being fully enclosed. A two ring top radiator has as many feet of heating surface as found in many furnaces.

The heater has but two joints. The lower one is tongue and groove—the inside sealed with insulation and refractory; the upper joint, where the radiator rests on the combustion chamber, is iron to iron construction protected by high temperature cement on both sides.

The air conditioning unit, enclosed in a matching two-tone green enamel casing of 20-gauge automobile body steel, contains the blower, four filter suction motor.

The company also offers a round galvanized Oil-Economy Furnace at a lower price to which is attached the same blower, humidifier, and filtering equipment.

Either new furnace can be used in gravity systems, is available for either gun or rotary burner, and equipped with an automatic humidifier.

◆

85—Room Cooler

A new room-type cooler, containing blower, filters, compressor and designed for plug-in operation, is announced by the General Air Conditioning Corporation, Cincinnati, Ohio. The unit is manufactured in a portable, permanent room type, and in suspended type unit. Full information on capacities and type will be supplied by the manufacturer.

The PREMIER FURNACE CLEANER

Now!!! Premier announces a complete line of Premier Furnace and Boiler cleaners. Not just one model, but a complete line of four models covering a price range that brings this powerful cleaning service within your means. Models with ½ H.P. motors and a maximum water lift of 31 inches are priced, completely equipped, at $55.00 and $59.50. Models with 1 H.P. motors and a maximum water lift of 46 inches are priced, completely equipped, at $79.50 and $84.00. All cleaners are of the highest quality and are manufactured by one of the world's largest and oldest exclusive vacuum cleaner manufacturers.

Write or Wire for Details Today.

$55.00 TO $84.00

Standard Equipment for $55.00 and $79.50 Models
12 foot Metal Hose.
6 inch Bristle Brush.
5 inch Nozzle.
Guard.
Blower.
Adaptor.
Curved Cleaning Tool.
Hose Protector.

Special Equipment for $59.50 and $84.00 Models
6 foot Metal Hose.
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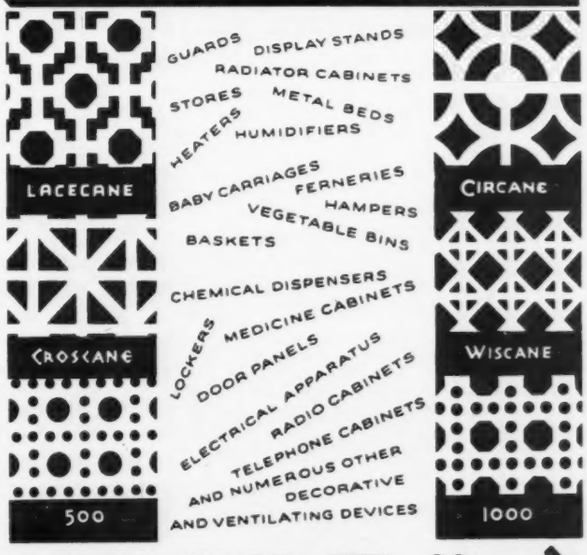
5 inch Nozzle.
6 inch Bristle Brush.
6 inch Wire Brush.
4 inch Scraper Nozzle Coupling.

Buy It From Your LOCAL JOBBER

ELECTRIC VACUUM CLEANER CO., INC.
1734 Ivanhoe Rd. Cleveland, Ohio

Decorative PERFORATED METALS



WICKWIRE SPENCER STEEL CO.
41 East 42nd Street, New York City
Buffalo Worcester Chicago San Francisco

Send for this folder "Wissco Decorative Perforated Metals." It shows scientifically planned designs offering both greater free air openings and concealment.

WICKWIRE SPENCER perforated metals

A Complete Line of Furnaces Means . . . . . .

• BIGGER PROFITS

Here is a complete line of cast iron or steel furnaces, either gravity or forced air types that give you a complete range of styles, and priced so that you can meet all competition. When you handle the Liberty Line you can quote on all installations regardless of size or type of firing, giving you larger volume of sales which means Bigger Profits.

HEATING FRONT RANK SYSTEMS

The FRONT RANK gravity type warm air furnace is the result of 45 years of knowing how to build furnaces with high efficiency and economy. Heavily constructed of high quality steel, rigidly riveted and welded with tubular type radiator. The FRONT RANK Crescent is also of steel construction but is equipped with crescent type radiator to give higher heat radiation. The new FRONT RANK DeLuxe is the last word in forced type warm air conditioners. Entirely automatic with balanced humidifying and temperature controls it meets the demand for the most modern dwellings. It can be equipped with oil or gas burner, automatic stoker or can be hand fired.

The Mellow warm air furnaces are America's Perfect Heating units. They are made of solid cast construction and are designed for high efficiency and long life. They are manufactured in gravity type, as well as in the more advanced forced air types that condition air. They, like the DeLuxe Front Ranks, have automatic humidity and temperature controls and can be equipped with gas or oil burners, automatic stokers or can be hand fired.

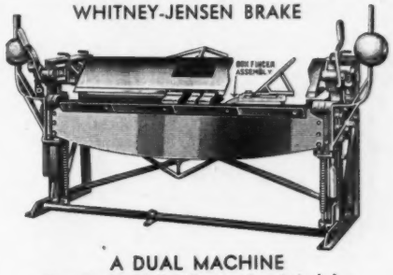
MELLOW WARM AIR FURNACE

Distributors and Dealers

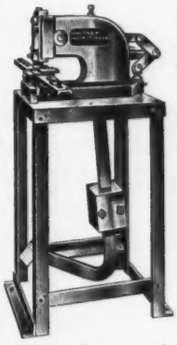
Here is a line you should investigate. The Furnace season is at its peak right now so you better write for complete information.

LIBERTY FOUNDRY CO.
St. Louis, Mo.

WHITNEY-JENSEN BRAKE



A DUAL MACHINE
Can Be Used for Pan or Box Work by Inserting Box Fingers.



FOOT PRESSES. Like all Whitney tools, this foot press is built to give a lifetime of good service. Expertly designed and made of the best materials throughout.

IMPERIAL ROLLER BEARING PUNCHES. Offered in 3 sizes. Will work inside 90 degrees. Quick changing for punches and dies. No cams to wear. Stripping positive.

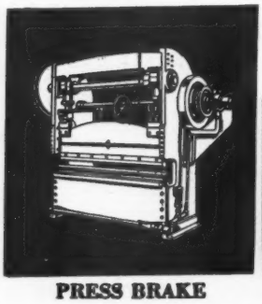
Write for complete catalog on Brakes, Punches, Shears, Angle Iron Machinery, etc.

WHITNEY METAL TOOL CO.
91 Forbes St. Rockford, Ill.

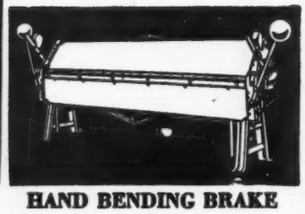
SALTS OR PASTE?
Either IF IT'S GOOD OLD
BURNLEY
TRADE MARK

The Paste is ready to use—the Salts need a little water—you'll know how much for that's experience. Whichever you choose you can be sure that you have made a good choice. Write for sample—buy from your Jobber.

Burnley Battery & Mfg. Co • North East, Pa.
Soldering Paste, Salts, Solution, Stick



CHICAGO



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Steel Brakes—Presses—Shears
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Auditorium hotel rooms are large, spacious and comfortable with beds that were really made for restful slumber.

WITH PRIVATE BATH FROM $2.50
WITHOUT PRIVATE BATH – $1.50

Live on Michigan Avenue, close to the Loop, when you visit Chicago. Enjoy the traditional luxury of the Auditorium Hotel—yours now at an extremely moderate cost.

AUDITORIUM Hotel
MICHIGAN AVENUE AT CONGRESS ST.

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 100.

310—Time and Magnetic Switches

Zenith Electric Company, Inc., 607 South Dearborn Street, Chicago, Illinois, manufacturers of automatic control equipment, is distributing bulletins on time and magnetic switches.

◆

311—Cornell Rolling Grilles

Cornell Iron Works, Inc., 3600 Thirteenth Street, Long Island City, New York, has just published a new catalog entitled "Cornell Rolling Grilles," giving installations and full dimensions. Cornell grilles operate like rolling doors, but give equal security without blocking light, air or vision. They are made in steel, aluminum, bronze or stainless steel, and are used for store fronts, entrances and gateways, counters and bars, and many other applications.

◆

312—Oil Burner Leaflet

Electrol, Incorporated, 934 Main Avenue, Clifton, New Jersey, has just published a new mailing piece to acquaint consumers with their new Model TCV vertically mounted oil burner for jacketed boilers, as well as furnaces and direct-fired air conditioning units. It embodies master control, curved air chamber, cut off valve at nozzle, ball flame, and other distinctive features.

◆

313—Accessories

David Levow, 308 West 20th Street, New York City, is distributing a loose leaf catalog covering their "Fitrite" skylight gearing; roof strainers; adjustable pipe snow guards; roofing equipment such as mop heads, scrapers, buckets and dippers; adjustable swing chimney top frame; rotary turbine exhaust ventilators; architectural wrought and cast leadwork; items specified for U. S. post office buildings and other government construction; and one-piece ornamental conductor pipe straps.

◆

314—Cycloidal Atomizing Units

Blower Application Company, 918 North Fourth Street, Milwaukee, Wisconsin, is distributing a four-page circular entitled "Cycloidal Atomizing Units for Air Conditioning Application."

These units consist of a weather-proof, fully inclosed, fan-cooled motor with single or double shaft extension having one or two cycloidal atomizing wheels mounted thereon. The motor is housed in special air flow cadmium plated hood. Fire type nozzles of the proper size and motor starters with overload protection are furnished with each unit.

◆

315—Vail Shutter-Awnings

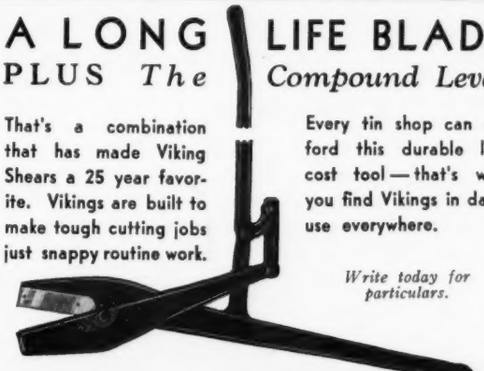
The Bostwick-Goodell Co., Norwalk, Ohio, is distributing a small folder illustrating and describing the Vail shutter awning made of wood and metal—beveled wooden blades (4½ inches wide) secured to light strong metal frames. The mechanism is simple and sturdy. The shutter-awnings are custom built to fit any window or opening, and are furnished in any color. They remain in place the year round, saving handling and storage, yet they can be easily removed. The blades are adjustable from the inside—closed to protect from sun and storm or opened to admit air and light.

A LONG LIFE BLADE
PLUS *The* *Compound Lever*

That's a combination that has made Viking Shears a 25 year favorite. Vikings are built to make tough cutting jobs just snappy routine work.

Every tin shop can afford this durable low cost tool — that's why you find Vikings in daily use everywhere.

Write today for particulars.



VIKING SHEAR CO., Erie, Pa.

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More than twenty kinds of prime quality sheets are carried in stock. There is a special sheet for every purpose. Also Bars, Angles, Rivets, Bolts, Tools and Metal-Working Machinery.

Write for Stock List

JOSEPH T. RYERSON & SON Inc

CHICAGO DETROIT MILWAUKEE ST. LOUIS JERSEY CITY CINCINNATI BUFFALO CLEVELAND PHILADELPHIA BOSTON

SHEETS

ALL REPAIR PARTS for FURNACES BOILERS STOVES RANGES

A.G. BRAUER SUPPLY COMPANY

316 NO. THIRD ST. + SAINT LOUIS

IN STOCK • READY FOR IMMEDIATE SHIPMENT

KEEP OLD MAN WINTER ON THE RUN

XXTH CENTURY HEATING & VENTILATING CO.
AKRON, OHIO

HOTEL LENOX

Comfortable rooms—Attentive service—Memorable meals at fixed, fair prices—Only 5 minutes from the business district yet removed from downtown din—Rates, $1.50 to $3.00 per day per person—Descriptive folder containing map of downtown Buffalo mailed upon request.

140 NORTH ST. NEAR DELAWARE AVE.

CLARENCE A. MINER PRESIDENT

BUFFALO, N.Y.

IRONSET

the Furnace *and* Retort Cement

THAT IS GUARANTEED

Not to crack, bloat, shrink or blister

A Fireline Product— Write for Circular

Fireline Stove & Furnace Lining Co., 1866-G Kingsbury St., Chicago

ESTIMATING BOOK *FREE!*

Net cost of individual runs of warm-air and cold-air pipe for quick estimating. Also net prices on all registers, piping and supplies.

Up-to-the-minute information and prices on blowers and forced-air jobs, with valuable tables.

No obligation. Send coupon today.

ROCK ISLAND REGISTER CO.
Rock Island, Illinois

Mail free estimating book without obligation to

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Unusually Comfortable Rooms at Reasonable Rates, and the finest of Food and Beverages, Carefully Prepared and Served.

IN PHILADELPHIA

THROUGH three generations distinguished visitors to Philadelphia have preferred the comforts of this hotel . . . its noted cuisine . . . and the spirit of its service. Rates begin at $3.50.

Air-Conditioned Restaurant

BELLEVUE STRATFORD

One of the few Famous Hotels in America

CLAUDE H. BENNETT, General Manager

New Literature . . . .

For your convenience in obtaining copies of new Literature, use the coupon on page 100.

316—Berger Copper Products

Berger Bros. Co., 229-237 Arch St., Philadelphia, has produced a small folder for dealer distribution with his imprint thereon, illustrating and describing their B. B. and Quaker City copper products—gutters, conductor pipes, mitres, end pieces, caps and outlets, conductor heads, ornamental conductor straps, elbows, hangers, hooks, clasps, cleats, shanks and circles, circle clips and pipe fasteners.

◆

317—Insulation Catalog

The Ruberoid Company, 500 Fifth Avenue, New York City, announce a new Ruberoid-Watson insulation catalog showing and describing the various types of pipe coverings, asbestos flat sheets, tape, millboard, blocks, cements, adhesives, insulating sheets and miscellaneous other insulating materials manufactured by the company. Various items are shown by photographs accompanied by full tables of catalog numbers, sizes and proper selections for usage.

◆

318—Williams Oil-O-Matic's "The 10 Majors"

Williams Oil-O-Matic Heating Corporation, Bloomington, Illinois, has published and is distributing the sixth edition of "The 10 Majors"—a manual of instruction for Williams Oil-O-Matic salesmen, equipping them with the fundamentals of fuel oil combustion and oil burners.

The Ten Major subjects cover the basic fundamental facts upon which Williams Oil-O-Matic rests their claims.

◆

319—Alloy Data Book

Maurath, Inc. 7309 Union Avenue, Cleveland, Ohio, is distributing a 54-page price list and alloy data book covering their electrodes. The book—Wire-O bound—is indexed and is intended to be of service to the welders of alloys. The various stainless and heat-resisting alloys produced by the different manufacturers along with the complete analysis and the proper electrodes for welding are clearly tabulated.

◆

320—Leaflet of Prefabricated Shapes

A reference manual for architects, engineers and contractors, giving full explanation of prefabricated metal building shapes is announced by Stran-Steel Corporation, 6100 McGraw Avenue, Detroit, Michigan. In addition to numerous photographs and drawings showing recommended methods of assembling and installing the prefabricated units, the text matter explains just what the advantages are and how the framing should be used.

◆

FOR YOUR CONVENIENCE

American Artisan, 6 N. Michigan Ave., Chicago, Ill.

Please ask the manufacturer to send me more information about the equipment mentioned under the following reference numbers in "New Products" and "New Literature." (Check numbers in which you are interested):

75	76	77	78	79
80	81	82	83	84
85				
301	302	303	304	305
306	307	308	309	310
311	312	313	314	315
316	317	318	319	320

Name ..... Title .....

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Are you Manufacturer——Jobber——Dealer

FURNACE BRUSHES—WIRE or FIBRE

ROUND STEEL WIRE BRUSH

Built for hardest use by trained artisans. Highest quality, oil tempered steel, double twisted wire stem. Special sizes to meet any requirement. Write for circular.

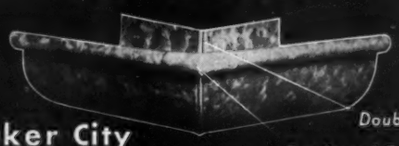
SCHAEFER BRUSH MFG. CO.
1007—S. 2ND ST., MILWAUKEE, WIS.

SCHAEFER GUARANTEED

Which means, that you must and will be satisfied with any SCHAEFER brush you buy.

SCHAEFER BRUSHES
BUY SCHAEFER-IT'S SAFER

"BB" QUALITY



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WRITE FOR "BB" CATALOGUE
Order from your jobber

Mitres, conductor pipe, hangers, eaves trough, caps, outlets, pipe hooks and fasteners

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4 cents for each word including heading and address. Count seven words for keyed address. Minimum $1.00 for each insertion. One inch $3.00. Cash must accompany order. Copy should reach us eight days in advance of publication date. Display rates for this page will be furnished on request.

SITUATIONS WANTED

SALES ENGINEER with successful experience as sales manager and engineer in gravity and air conditioning systems available August 15 to a reputable and aggressive manufacturer or dealer. Address Key 378, "American Artisan", 6 No. Michigan Ave., Chicago.

FOR SALE

14 No. 24C Sunbeam Firepots with Gas Rings CHEAP. MINET HEATING SUPPLY CO., 865 E. Ferry St., Buffalo, New York.

FOR SALE: Complete outfit of tinner's and light sheet metal workers tools, and also plumbers tools. E. H. Meyer, Adm. Elmore, Ohio.

FURNACE PATTERNS—Size 22 and 24 inch firepots. Open Dome. Over 1000 installed in Western Pennsylvania—all satisfied customers. Will sell at a bargain. Inquire Allegheny Furnace Repair Company, 1254 Stedman St., Pittsburgh, Penna.

RIBBED WIRE GLASS-13c per SQ. FT.
STOCK SHEETS, CASE LOTS, PLUS BOXING F. O. B. BUFFALO, N. Y. SHIPMENT TO ANY PART OF THE UNITED STATES
QUOTATIONS ON ALL KINDS OF GLASS ON REQUEST
Write for Samples
T. J. ATCHESON GLASS CO.
953 Main St., Dept. A, Buffalo, N. Y.

WANTED TO BUY

WANTED—A good used power press brake at least 6 feet between housings with a capacity of 5/16" over a 2" V die. Give all particulars such as age and make of machine, type of dies available, location, etc. Address Key 377, "American Artisan", 6 No. Michigan Ave., Chicago.

Manufacturers Agents

MANUFACTURERS WANTING ADditional representation often come to us for names of prospective agents now handling other lines in this field on a commission basis in a definite territory. It will pay you to be on record with us so we can refer your name to interested manufacturers. No charge or obligation, of course. It is a service we render free to manufacturers and representative. Just drop a line that you are interested in being on file and we will send you form to fill out. Address American Artisan, 6 N. Michigan Ave., Chicago, Ill.

FOR SALE

Sheet Metal Machines
New and *Really Rebuilt*

A machine for every use and every machine is ready for use. The largest stock in Chicago. Ask for list.

Complete supplies and tools.

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